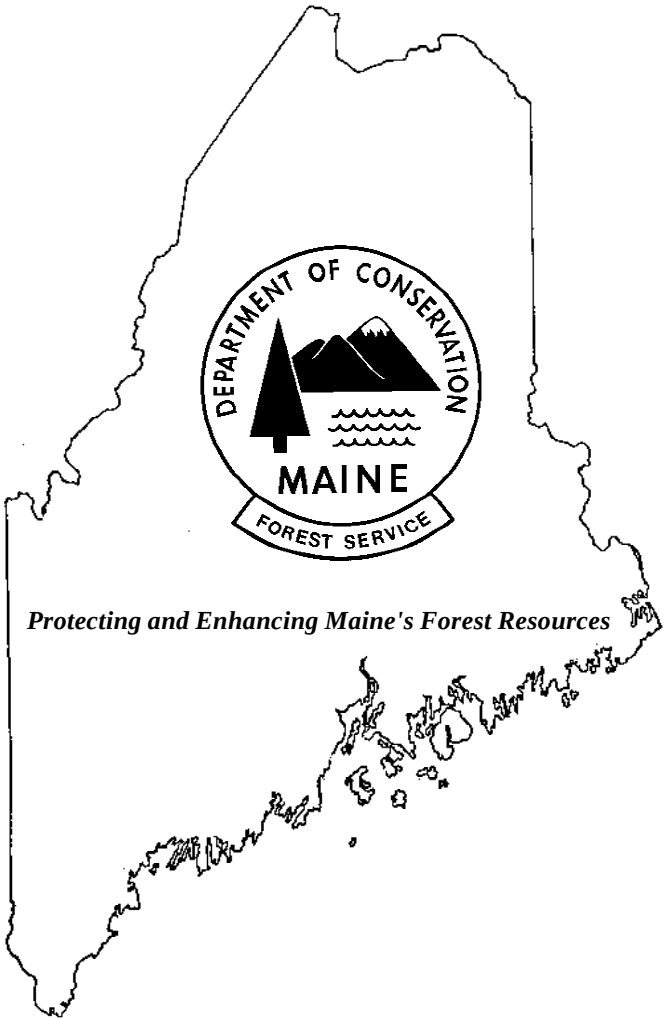
Forest & Shade Tree Insect & Disease Conditions for Maine

A Summary of the 1999 Situation



Forest Health & Monitoring Division
Summary Report No. 14
March 2000

Maine Forest Service
MAINE DEPARTMENT OF CONSERVATION
Augusta, Maine

MAINE

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Reflects staffing for the 1999 season

Table of Contents

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Acknowledgements

This summary has been compiled and edited by **Richard Dearborn** and **Clark Granger** from input received from the staff of the Forest Health and Monitoring Division (**FH&M** - note our **name change** p. 2) and many cooperators. State Entomologist, **Dave Struble** contributed entries and proofread the final draft. **Dick Bradbury**, **Charlene Donahue, Ken Laustsen, Don Ouellette** and **Henry Trial, Jr.**, of our staff wrote items and otherwise contributed to the compilation process. Our regular field staff, **Skip Cram**, **Mike Skinner** and **Grayln Smith** provided us with information and records on various insects and diseases and assisted on several intensive state and federal projects. Thanks go also to the federally funded seasonal staff. **Wayne Searles**, who worked on the White Pine Blister Rust Program, also provided additional input for this report. **Darlene Stebbins** continued her work at the lab on the MOHF grant to computerize insect collection specimen data and government interns: **Virginia Roberts**, **Aaron Weed** and **Lynn Wihbey** assisted on a variety of field and lab based projects. Changes in a number of entomology programs in 1999 (see **Comments from the State Entomologist, p. 1**) limited the availability of some FH&M staff for general insect and disease survey work.

A special debt of gratitude again goes to **Betty Barry** who had to put all of the pieces of the puzzle together for review and then integrate the multitude of changes and corrections necessary to produce and mail this finished product.

Our thanks go to many other administrative and field staff in the Maine Department of Conservation who facilitate much of our work and to cooperators associated with the USDA-Forest Health Protection, USDA-APHIS, Maine Department of Agriculture, University of Maine at Orono, and cooperators in other New England States and Maritime Provinces of Canada. Our thanks go too to our clients; arborists, Christmas tree growers, foresters, landscapers, nurserymen, etc. for your support in keeping us apprised of what you see in the course of your work.

Suggestions for Quick Access to Particular Items

This season's report is set up in roughly the same format as that which was used in last year's report. The Table of Contents along with the "Highlights" section and the Index should still provide most of the help you need in narrowing down your search for items of particular interest. Cross referencing within the text is used in the case of complex problems. We have again provided our very brief **one-point assessment table** (Table 1, p. 10) for damage level trends for quick review for many of our common problems. You should still scan the entire report to pick up **new items** of interest as well. Keep in mind the following when scanning for particular problems:

- **Quarantine related issues** have been brought together in a new section (p. 3) for easy reference due to their unique importance. An overview of all state **quarantines** can be found on p. 58.
- **Insect problems** associated with both trees and shrubs in forest, plantation, shade tree and ornamental situations are broken down into only two categories. All **softwood (conifer) insect pests** are grouped in Section A (p. 14). All **hardwood insect pests** are in Section B (p. 24).
- **Miscellaneous insects and other arthropods of medical**, **nuisance or curiosity significance** have their own section (p. 38) which also includes an expanded series of tables showing the variety of **public assistance** requests received by FH&M (pp. 42-45).
- **Tree diseases and injuries** are listed alphabetically in a separate section beginning on page 46.

For additional information you might wish to visit our website as well at:

<http://www.state.me.us/doc/mfs/idmhome.htm>

*NOTE - .Those who are receiving this summary through our regular March 2000 mailing will also find copies of the Ice Storm 1998 report and Circular No. 11 (Revised) included.

FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE - A SUMMARY OF THE 1999 SITUATION

Comments from the State Entomologist

During this past year we have experienced a level of staffing changes not seen since the spruce budworm era. It seems appropriate to take a few lines to identify and welcome our new members, bid farewell to those who have gone on to new challenges, and take a moment to remember and honor the contribution of those who have passed away.

Matt Gallucci, Jeff Martin, and Jeff Harriman were hired this past spring as Forest Survey Technicians, with their primary responsibility to staff the field aspects of the Forest Inventory initiative. They all came with strong USFS forest inventory experience, and are proving to be valuable additions to our staff. (In addition we also hired a number of temporary seasonal staff to work with existing permanent staff).

Ken Laustsen, formerly woodlands analyst with Great Northern Paper Co, was hired to fill our forest inventory biometrician position. Ken's primary responsibility is to work with the USFS to generate annual reports assessing the status of Maine's forest resources. He also provides analytical support to other branches of the MFS.

Thomas Doak of Hallowell was appointed as State Forester, replacing Chuck Gadzik, who resigned to take a position in private industry. Tom had formerly worked within the Maine Forest Service, starting in 1991 when he was hired to head the Policy, Planning and Information Division. For the past three years Tom has been head of the Policy Unit at the Maine Dept of Agr. He comes back to MFS with a full appreciation of the issues and the preceding history, and is a strong supporter of efforts to monitor and manage the health of our forests.

Jody Connor, one of our veteran entomology technicians, resigned in 1999. Jody had worked for the Division for 20 years, having started like many of us, working on the spruce budworm problem. Jody left to devote more time to his burgeoning nursery business. We wish him success in this endeavor and look at this transition as gain of another client/cooperator (vs loss of a valuable employee).

It is with deep sadness that I report the death of two of our former coworkers. Dot Arbour, who first came to work at the lab in 1983 under the "Elder American Program" and stayed on as a permanent addition, died unexpectedly May 30th. Dot will be remembered for her irrepressible spirit and willingness to take on any duties to get the job done. She handled much of the clerical support work and the unglamorous but critical activities to assure that supplies were ordered, assembled and dispensed to support the pest survey effort. She leaves a large hole.

On June 3rd, Dave Stewart, who started his tour in the division in 1952 and had retired in 1996, passed away after a short illness. Dave started in the White Pine Blister Rust Control program, where he spent much of his career. After the Division restructuring in 1987, Dave took on broader duties, and was the field technician for southern Maine until his retirement. Dave's encyclopedic knowledge of local history, his devotion to his work, family and friends, his cheerful demeanor and his continued involvement with FH&M programs even after he retired are gratefully remembered.

Regarding our accomplishments:

Early in 1999 we completed the field ground assessment of the 1998 ice storm damage. Because of the overwhelming interest in the aerial photography of the storm footprint, we acquired an additional 1.2 million acres of photo coverage, bringing the total coverage to 4.2 million acres. Our contributions to the regional ice storm assessment are summarized in a separate section in the "Cooperative Projects" section (p. 4). Currently we are looking more closely at Maine's state-specific data, with plans to generate a more detailed report regarding the Maine situation. Preliminary analyses suggest that we will be able to overlay our ground plot data on the sketch-mapped and photo-interpreted polygons to generate a powerful assessment of the levels and patterns of initial damage. These data not only capture the extent and intensity of the present situation, they also serve as a baseline to assess long-term impacts of the storm. We are exploring opportunities to revisit a sample of these sites in the future to better define the longer term effects.

Other accomplishments for 1999 include:

- Successful browntail moth and yellowheaded spruce sawfly management projects: 5,520 acres aerially treated without incident
- Developing, with industry cooperators, an Integrated Crop Management brochure for softwood plantations and seed orchards.
- Increasing availability and use of FH&M historical data via electronic databases and internet technology. At this writing the Division is cooperating with the State's web support service provider to provide a queriable database for our historical records. Increasingly these data are being sought to address concerns about our local forest ecosystem's fragility/resiliency.
- Successful cooperative faunistic survey projects with Acadia National Park and the Manomet Center for Conservation Studies (Shifting Mosaic Project). Additional collection support was provided to the Maine Chapter of The Nature Conservancy.

The major division activity for the past year was conducting the first year of Maine's new annualized forest inventory. One early response to this new assignment was to change the division name from the Insect & Disease Management Division to the **"Forest Health & Monitoring Division" (FH&M - name change)** in recognition of our expanded role.

Despite the new positions provided by the 118th Maine Legislature, the inventory effort required the commitment of all other division field staff plus 2 field crews provided by the USFS's Forest Inventory & Analysis (FIA) Unit. Without everyone's involvement and a strong collaborative effort, we would not have been able to complete our assignment this year.

We continue to work with the FIA to maximize the benefit from our shared mandates and activities. At the same time we have been meeting with an advisory group of within-state stakeholders to assure that the generated data will serve the needs of the larger local client community.

As predicted last year, the near total commitment of field staff to inventory severely limited our internal capacity to address traditional (and still important) forest health/pest management issues/situations. In response, staff and cooperators stepped forward with innovative approaches and additional support that allowed us to continue to provide the services that our client public expects. Despite a couple of serious unanticipated exotic pest situations (see quarantine issue section below) we were successful in discharging our mandates. Based on the success of the 1999 season and some anticipated additional internal support, I am optimistic about our ability to meet expected challenges in 2000.

I can not overemphasize how crucial the assistance of our client/cooperators is to the success of our mission. It always has been an important component in effectively gathering information regarding pest and forest conditions, and dispersing it out to the larger public. During this period of transition, when we are incorporating the capacity to conduct the forest inventory into our overall monitoring effort, it is critical!

As always, I reiterate that it is critical that these Forest & Shade Tree Insect & Disease Condition Reports be useful to you. We sincerely hope that you will read them, use them, and keep in touch with us regarding information or suggested improvements so that they continue to meet your needs.

Quarantine Related Issues

During 1999, we had several exotic pest situations that merit comment beyond our usual exortations for vigilence.

In April, the ***hemlock woolly adelgid*** (see pp. 16 & 59) was inadvertantly shipped from Connecticut into Maine on untreated nursery stock. This incident demonstrated the importance of our public awareness/outreach network. The initial discovery of an infested outplanted hemlock (in August) was provided by an informed homeowner. Further, when the Maine Dept. of Agriculture, affected local nurseries, and the MFS went to the media to alert the public regarding the situation, our clientele and the general public responded immediately.

At this writing we have located and treated/destroyed the vast majority of the potentially infested nursey stock. Working with Maine Dept. of Agriculture, we have addressed the weak link in our notification/tracking system for imported nursery stock to assure that the 1999 situation will not be repeated in the future. We will be conducting another media campaign in early summer to alert our summer residents to this situation and to locate the yet outstanding hemlock from last April's shipment. We are cautiously optimistic that we have arrested this introduction, but plan increased surveys for this pest in southern Maine over the next few years.

Pine Shoot Beetle (see p. 18) - A few individuals of this exotic pest, which has been in the midwest for more than seven years, were trapped this past spring in Essex and Orleans Co., VT and Coos Co., NH. Additional beetles were similarly detected in adjacent localities in Quebec. Although we conducted similar trapping in western Maine, no PSB were discovered. With these "finds", USDA-APHIS and Ag Canada are proceeding with plans to quarantine the infested counties.

There is considerable debate regarding the level of threat that this beetle poses. Most of the states in the currently infested area of the midwestern U.S. treat PSB's presence more as a nuisance than as a serious biological threat. However, experiences in Ontario last year demonstrate that, at least when otherwise-stressed Scots pine is a significant component of the stand/plantation, this beetle can build up and kill both hard and white pines.

Where PSB is apparently now established to our immediate west, we are working directly with officials in VT, NH and Canada to assure that this pest is not inadvertently imported on pine logs or bark products. We are also cooperating with APHIS and Agr. Canada to develop treatment protocols for decontaminating potentially infested pine products. These efforts not only assure that raw materials we import into Maine pose no threat to our resources, they will also be critical tools for assuring that Maine firms can continue to merchandize our milling by-products in the national barkmulch/soil amendment market.

White Pine Blister Rust (see pp. 56 & 58) - Recently there has been intense interest by the commercial *Ribes* industry to relax quarantine efforts in many states to permit the culture of currents and gooseberries, especially for juice. The cranberry juice industry seems particularly interested in expanding its product base to include cranberry-currant juice. And many currant growers are eager to expand their operations into the northeastern United States, where conditions for *Ribes* culture are ideal.

This prospect is an anathema to quarantine regulators in many state government agencies, who have spent careers attempting to eradicate and prohibit the sale of currants and gooseberries in white pine growing areas. *Ribes* advocates are convinced that *Ribes* and pine can co-exist as profitable crops, especially now that resistant cultivars are available. Pine growing interests are concerned that the resistance may be incomplete or may not carry into future generations of *Ribes* progeny distributed into the wild by birds or other vectors. Government agencies are concerned that the legal introduction of resistant varieties and the prohibition of susceptible varieties would be a nightmare to regulate.

Reports and communications resulting from recent national conferences have strengthened our resolve to maintain our present quarantines: Sales, planting and cultivation of all *Ribes* (currants, gooseberries, etc.) continue to be prohibited in the southern one-third of Maine; Any *Ribes* variety having European black currant (*R. nigrum)* in its parentage are banned throughout the state.

Cooperative MFS/USFS Projects

Competitive Focus Funding Grants

A Re-evaluation of Forest Regeneration in Spruce Budworm Damaged Stands Within Baxter State Park. This evaluation of regeneration in spruce budworm killed stands is currently on hold while we await promised historical background data held by the USFS-Research. These data, which detail periodic condition and decline of the previous overstory component, will be invaluable in assessing type conversion and patterns of natural stand cycling/recovery.

In the meantime, we are contacting industrial landowners with adjacent holdings to determine possible availability of similar periodic overstory and regeneration information for areas where there was active intervention against budworm. If we are successful in getting information from the USFS and landowners, we will have the basis for a powerful modelling and decision making tool.

Cooperative Regional Assessment of the "Ice Storm of 1998"

Assessment of the "Ice Storm of 1998" continued throughout much of 1999. During the winter of 1998/99 tree damage data were collected from 122 plots in an additional 19 ice damaged areas (polygons). The 19 additional polygons were defined by interpretation of high resolution aerial photography taken in the spring of 1998. Eight ice photo generated polygons had been assessed in 1998 but the additional plots were needed to more completely characterize of all damage categories.

In March of 1999, 167 additional ground plots were assessed in the Columbia Falls area to complete the third area of the so-called "quarter quad study". This study was designed to compare aerial sketch mapping and aerial photo interpretation to ground truth data. The other two areas assessed for this study were completed in 1998 in Liberty and Buckfield. Completion of the 1999 ground assessment brought the total number of ice assessment ground plots in Maine to over 1500.

In the spring of 1999 an additional 1.2 million acres of ice damaged forest were photographed using the same methods employed for over 3 million acres of photography in 1998.

Interpretation of this photography is now complete and available. A small portion of the area photographed in 1998 was re-photographed in 1999 and comparisons of the two sets of photos and interpretation are underway. Also in 1999, a double flight line of photos was extended well outside the heavily damaged area. Future assessment of these "outside" photos is expected to more accurately define areas of trace damage.

Analysis of ice damage data collected during 1998 in the northeast area was completed during 1999 and a regional report was prepared. A copy of this report "The Northeastern Ice Storm 1998 - A Forest Damage Assessment for New York, Vermont, New Hampshire, and Maine" will be distributed with the initial mailing of this conditions summary. See also "Ice Damage" p. 52.

Forest Inventory & Analysis (FIA) - Panel #1 Synopsis of the 1999 Measurement and Analysis Effort

Implementation Plan **-** Initial development of the current Implementation Plan (April 30, 1999 iteration) occurred at a meeting of the Inventory Advisory Committee convened by the Maine Forest Service (MFS) at the University of Maine on November 24, 1998. A wide array of stakeholders attended with the objective of outlining the critical needs to incorporate when implementing the new annual inventory. Additional meetings and conferences of USFS and MFS specialists focused on the core variable listing and development of a Field Manual. In February 1999, the Advisory Committee reconvened to finalize the list of measurement variables and other procedural details. The implementation process was fluid and a work in progress over the 6-month planning horizon - changing as the new national measurement protocols were proposed, other information needs were evaluated, and variable tradeoffs discussed.

The concept of national core variables and plot design, and the competition between national needs vs. unique local needs continues to generate debate. While the MFS supports the goal for the creation of data collection procedures for a single consistent and uniform framework across all FIA Units, we are equally adamant in maintaining that, on the average, a 2-person crew must complete a plot measurement in a 1-day visit.

Maine is implementing a design of 5 Panels, where the number of sample panels corresponds to the number of years in the inventory cycle. Each year's panel is evenly distributed across the entire state and no member of a particular year's panel has an immediate neighbor that is visited in the same year. Therefore, Panel #1 represents the first measurement year of the 5 year inventory cycle.

Training and Field Measurement - In April 1999, a total of two USFS crews and six MFS crews were trained and certified over a two-week period by USFS personnel. Field measurement of Panel #1 plots began immediately in late April. Crew productivity steadily increased through the summer and an overall average of 3.3 completed plots per week per two-person crew was achieved. Panel #1 had its fair share of startup problems to overcome. Crew efficiency was impacted by the unavailability of the full complement of Panel #1 plot tally sheets at the start of the measurement season. Plots trickled in over a two-month period, delaying preparatory work like landowner contacts and increasing allocation inefficiency. Also, data entry and analysis was potentially handcuffed by the unavailability of Portable Data Recorders. Their availability in late August, after 50% of the plots were completed, forced the MFS to pass on their introduction at that time, in order to maintain measurement progress and data reliability. In spite of some setbacks, field data collection was completed on December 7th, ahead of schedule. A total of 680 forest inventory plots were established/reestablished and measured. Crews are currently preparing for the 2000 field season. During 2000 the forest inventory plots in Panel #2 will be measured using three USFS and four MFS crews.

Data Analysis and Reporting - The 118th Legislature mandated that the MFS annually provide them a report on the Forest Inventory Program. The MFS is currently working with the USFS FIA unit in Newtown Square, PA to prepare the 1999 data for analysis. All field data were sent to the USFS and have been reviewed and entered into the federal databases. It is anticipated that in the Spring of 2000, a presentation will be made to the Maine Legislature on Panel Year #1's progress and gross comparisons of population estimates to the 1995 Resurvey, with a printed report to follow.

National Forest Health Monitoring Program (NFHM)

In 1999, measurement of the National Forest Monitoring detection grid continued using the sampling design established in 1996. With this design, a rotating panel of one quarter of the 137 detection monitoring plots in Maine plus an additional twelfth of the grid are measured annually. Plots in the one twelfth grid are measured for two successive years. Combination of the two grids equals approximately a third of the total plot network for sampling in a given season. In 1999, 45 forested and 3 non-forested plots were measured. Two two-person assessment crews were employed for NFHM measurement from mid June through September 1 season.

In response to the 1998 Farm Bill, efforts are underway to combine the NFHM program with Forest Inventory & Analysis (FIA), and to annualize the FIA survey within states. In Maine this merger of programs is evolving to a single combined survey conducted by state crews with support, oversight, and analytical assistance from a combined federal FIA/FHM organization. As part of this fledgling merger process in 1999, an effort was made by state staff to coordinate FHM and FIA survey activities. Beyond the coordination efforts, the major impact this past season was to have FHM crews sample an additional 23 established FHM plots which, although not slated for FHM remeasurement in 1999, were being remeasured as part of the FIA process. This was done so that a year of FHM data from these plots would not be lost as the merger progressed. In addition FHM plot records were provided to FIA crews to assist in plot location. In 2000, a much greater degree of merged effort is expected with FIA crews collecting all the data previously collected by FHM except that relating to soils, lichen, and ozone. Program survey grids, program administration, methods, and training are expected to be totally integrated.

New variables added in 1998 to assess soils and lichens were continued in 1999. Both soil and lichen sampling went extremely well in 1999; continuations of these variables as part of the standard national core measurements is expected. Another new set of variables designed to assess vegetation structure, down coarse woody debris, and fire loading was tested in a limited pilot in 1999 in other cooperating states. This process has resulted in additional pilot tests planned for 4 states (not Maine) in 2000.

NHFM methods and procedures continue to be widely employed in several aspects of Forest Health & Monitoring evaluations.

North American Maple Project (NAMP)

None of Maine's 18 NAMP plots were measured in 1999. Plots in Massachusetts, New Hampshire, New York, Vermont, New Brunswick and Quebec, however, were measured with an eye for ice storm damage data. The analysis of the 1999 data is being done with ice storm funds and should be available some time in 2000. The Maine plots will, however, be measured/remeasured in 2000. Beyond 2000, NAMP plot maintenance and some periodically scheduled plot remeasurement is likely. For more information on this program refer to our Summary Rpts. #12 (p. 5) and #13 (p. 5).

Maine Outdoor Heritage Fund Grant - Computerization of Insect Collections

Progress Report for Developing Electronic Access to the Information in Public Insect Collections in the State of Maine

The computerization of public insect collections moved ahead on most fronts in 1999. The Maine Forest Service data entry progressed smoothly throughout the year. The Department of Environmental Protection (DEP) activated their portion of the project and had specimens in their reference collection verified by experts. The University of Maine (UM) made some progress but continued to be plagued by a shortage of student labor.

The Maine Outdoor Heritage Fund granted us a one year extension on this project. There were delays in start up on the grant that put all of us behind, especially UM. Information will continue to be entered by UM throughout 2000 and posted to the web. The first part of the University's information is on the Internet at **http://www.umesci.maine.edu/biology/labs/entmus.htm.**

Almost the entire MFS reference collection was entered into the computer by the end of December. Information concerning location, site, date and species identification from over 35,000 pinned insect specimens is now accessible by computer at the I&D Lab. Identifications have been made to species on over 17,000 specimens. Specialists have identified 3,290 distinct species over the years in the MFS collection and the potential is there for many more. The information from the remainder of the MFS collection will be entered during the spring of 2000. This includes material from special projects and display cabinets.

Consultant Richard Obrey has set up the collection information in an Internet compatible database. It is up and running on a Department of Conservation computer and it has been tested for use through the Internet. We are now working on getting it installed on the State of Maine web site. A preview of information, but not the searchable format, of the MFS data is available at **http://www.state.me.us/doc/mfs/idmcoll/collcover.htm**. The DEP has their aquatic collection ready for posting to the State web site as well. Both of these collections should be on line and accessible by the public sometime this spring.

Conifer Seed Orchard Insect and Disease Study - 1999

Conifer seed is a valuable crop that comes under heavy pressure from insects. Not only are cone insects well protected within the cones but they are often obscure, difficult to identify and few have been studied well enough to understand their life cycles. Lacking this knowledge, low chemical input strategies are nearly impossible to effectively implement. Managers are interested in reducing their reliance on pesticides and requested assistance in identifying the significant insect pests and developing Integrated Pest Management (IPM) strategies. Accordingly

a multi-year study was set up in a seed orchard in Unity, Maine in cooperation with Plum Creek Timber Company, orchard owner. The Maine Forest Service ran a preliminary seed insect survey in 1996 at the SD Warren and International Paper Company seed orchards and the 1999 work is based on the information from this early study.

A variety of insect trapping methods were explored. These included emergence traps, sticky cards, light trap and bark beetle traps. Regular checks were made for insects and diseases not picked up by the traps. Two chemicals were tested for efficacy; dimethoate and soil injected imidacloprid. Plum Creek personnel assisted with field work in the spring and a government intern, Lynn Whibey, did much of the field work all summer. Lynn also dissected cones checking for insects and damage as well as helping with other projects.

The 1999 study was hampered by an extremely poor cone production season. There was also some evidence that imidacloprid injections must be accomplished a year prior to cone development in order to allow sufficient time for insecticide uptake and migration into cone tissues. Preliminary data from trap collections has yielded information on insect species, populations and life cycles. Several more years of study will be required before effective IPM approaches in seed orchards will become operational.

Cooperative Forest Biodiversity Projects

Biodiversity issues, albeit under another name - our Forest Insect Survey (F.I.S.), have long been the foundation of much of the FH&M work in Maine. In response to the recent rise in emphasis on forest biodiversity issues per se we are looking into how this might relate to forest change and sustainability. Two biodiversity studies were conducted in 1999 to address these issues utilizing two interns from the State Government Internship Program.

Sampling of Terrestrial Arthropod Populations in Three Forest Stands - Year Two

A forest biodiversity project was started on three plots (hardwood, softwood and partial cut) in T3R8 WELS in 1998 in cooperation with the Shifting Mosaic Program of the Manomet Center for Conservation Studies of Brunswick, Maine. The initial objective was to develop and evaluate a sampling protocol for soil surface invertebrates. In 1999 we continued to improve our sampling protocol, reduce field time and stress more rapid specimen processing, identification and data evaluation. Government intern Aaron Weed was able to bring specimen processing to a current level. The sampling protocol consists of one set of nine pitfall traps which are set out in a 4x4 meter grid in each of the three plots. Trap catches were processed weekly for six weeks in 1998 (June 10 to July 22) and nine weeks in 1999 (June 9 to August 4). Trap catches were sorted and specimens mounted for identification. Specimen identification and population assessments are underway.

Use of Light Traps as an Insect Monitoring Tool in Acadia National Park

The need for and development of a low impact/low maintenance survey tool for insect populations and how to translate any results into meaningful information for park land mangers have been debatable issues for some time. To help resolve these issues a light trap protocol was developed for 1999 to produce data which could then be evaluated. Some of the factors entering into this study, which was conducted at the headquarters at Acadia National Park in Bar Harbor, were: light source, trap type and placement and killing agent. Although emphasis was placed on the use of black light and on new insect records since the exhaustive Mount Desert Region Survey of William Proctor (1946), seasonal fluctuations and relative abundance of pest species were also considerations. This 1999 project was set up and conducted by our government intern, Virginia Roberts, who prepared a preliminary report for further consideration.

Publications

A file of publications is maintained at the Insect & Disease Laboratory in Augusta on a variety of forest resource related topics. This file contains publications of our own plus many from other sources as well. This file is upgraded and new fact sheets are prepared as needed on a wide variety of the more common tree pest problems. Our Technical Report series, now numbering 40, are listed on page 60 and many are still available. Extended conditions summary reports, such as this one, have been issued annually since 1987 (for the 1986 season). A limited number of sets of these summaries are still available.

Information on a variety of topics of current importance is also available electronically on our website at <**http://www.state.me.us/doc/mfs/idmhome.htm**>.

In addition to published reports, our staff continues to give talks to a variety of groups including schools and to provide items of interest to the news media and various association newsletters as well.

{ The following items were published during 1999 by our staff:

Bradbury, R.L. 1999 (October). The Browntail Moth, *Euproctis chrysorrhoea*, Summary of Maine Activities for 1996. Me. Dept. of Conserv./MFS/FH&M Division Technical Report No. 40. 13 pp.

Donahue, C. and K. Murray. 1999 (February). Maine's Forest Insect and Disease Historical Database: Database Development and Analyses of 16 Years (1980-1995) of General Survey Data. Me. Dept. of Conserv./MFS/FH&M Div. Technical Report No. 39. 17 pp.

Forest Health & Monitoring Division. 1999 (May). Forest & Shade Tree-Insect & Disease Conditions for Maine - A Summary of the 1998 Situation. MFS, FH&M Div. Summary Report No. 13. 64 pp. Compiled and edited by R.G. Dearborn and C.A. Granger.

____ 1999. Forest & Shade Tree-Insect & Disease Conditions for Maine. 4 seasonal issues from April 9 through October 1. MFS, FH&M Div. Compiled and edited by R.G. Dearborn and C.A. Granger.

Granger, C.A. and Geneva Duncan-Frost. 1999 (November). Integrated Crop Management Schedule for the Production of Christmas Trees. Me. Dept. of Conserv./MFS/FH&M Div. Circular No. 11 (Revised). Foldout leaflet.

Granger, C.A., C.Donahue and C.L. Haag. 1999. Integrated Crop Management Schedule for Softwood Timber Plantations and Conifer Seed Orchards. Me. Dept. of Conserv./MFS/FH&M Div. Circular No. 12. 11 pp.

LaBonte, G.A. and R.G. Dearborn. 1980 (Reprinted 1999). Field Book of Destructive Forest Insects. Me. Dept. of Conserv./MFS/FH&M Div. Bulletin No. 25. 28 pp.

{ Other selected publications from 1999 of possible interest to our readers:

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Forest and Shade Tree Insect and Disease Conditions for Maine

1999 at a Glance

The 1999 season lacked the one-two initial punch of the 1998 ice storms but weather again played a crucial role in many of our tree related problems. A milder than usual winter and early spring was followed by drought-like conditions in some areas from June through August. Although high moisture returned by September, soon elevating seasonal levels above normal, this helped little with drought stress already underway.

Continued ice damage fallout from 1998 and white pine decline resulting from the dry 1995 season were augmented by current drought related situations in 1999. This is not to say that insects and diseases did not play a role in our 1999 conditions. Beech continues to suffer from beech scale/nectria and resurging populations of oyster shell scale while coastal spruce is holding its own against eastern dwarf mistletoe and spruce beetle. Larch across much of eastern Maine were off color in mid season aerial surveys due to a complex of problems ranging from casebearer and sawfly to possible drought injury and foliage diseases. Christmas tree growers faced the usual complex of problems from late spring frost and foliage diseases to mites and aphids. Although balsam shootboring sawfly populations were in their low off year in 1999, balsam gall midge populations literally exploded in untreated areas. Numbers of spruce budworm continue to remain low but hemlock looper populations seemed to surge upward. Gypsy moth populations remained low in 1999 while the browntail moth infestation remained somewhat static. A variety of other problems were also investigated in 1999 but most were at expected levels. Perhaps one of the more notable defoliators observed other than those already mentioned was the fall webworm. Ticks were also an increasing problem in many areas of southern Maine.

We have had increasingly close encounters with some of the exotic pests over the years but so far the Asian longhorned beetle, Asian gypsy moth, Japanese (cedar) longhorned beetle and the pine shoot beetle have not become established in Maine. The pine shoot beetle has been found as near as northern New Hampshire and southeastern Quebec so we are watching for this one. The hemlock woolly adelgid however, was brought in on infested nursery stock but hopefully has been expunged. The concern over these potential threats to Maine's forest resources as well as questions associated with white pine blister rust have prompted increased dialogue between landowners and state and federal agencies. Quarantine related issues will likely be an increasing subject for discussion.

Table 1. Damage level (*) trends for 1999 (compared to 1998 levels)

Alder Flea Beetle/Leaf Beetle	↗	locally high
Annosus Root Rot	→	moderate
Arborvitae Leafminer	↗	locally high
Ash Leaf and Twig Rust	↘	low endemic
Balsam Fir Sawfly	→	low endemic
Balsam Gall Midge	↑	extremely high
Balsam Shootboring Sawfly	↓	low-off year
Balsam Twig Aphid	→	moderate to heavy
Balsam Woolly Adelgid	↗	locally high
Beech Bark Disease	→	high
Birch Casebearer	↘	spotty
Birch Leafminer (*Messa*)	↗	Southern
Bronze Birch Borer	↗	spotty
Brown Ash Decline	↘	trees improving
Browntail Moth	→	<2,500 A./spreading inland & E
Bruce Spanworm	↘	spotty and low
Bud Abortion (balsam fir)	↗	low
Butternut Canker	→	15 counties
Cone Buds (balsam fir)	↗	moderate
Coral Spot Nectria Canker	↗	moderate
Cristulariella Leaf Spot	→	very low or absent
Dutch Elm Disease	→	high
Eastern Larch Beetle	↗	heaviest Wash. & Hanc. Cty.
Eastern Tent Caterpillar	→	spotty and low
European Larch Canker	→	static
Fall Cankerworm	↓	spotty, Aroo. Cty. boxelder
Fall Webworm	↑	high SW >10,000 A.
Fir-fern Rust	↗	moderate
Forest Tent Caterpillar	→	low
Gypsy Moth	→	low/endemic
Hardwood Decline	→	little change from 1998
Hemlock Looper	↗	low and spotty
Horse Chestnut Leaf Blotch	↘	moderate
Ice/Snow Damage	→	damage still evident
Introduced Pine Sawfly	↘	spotty-parasitism increasing
Jack Pine Sawfly	→	moderate E coastal
Larch Casebearer	↗	heavy E-spotty elsewhere
Larch Sawfly	→	locally high
Large Aspen Tortrix	↘	spotty low
Late Spring Frost	↗	moderate
Maple Leafcutter	↗	light defoliation, <500 A.
Mountain Ash Sawfly	→	high, local
Oak Leaftier/Skeletonizer	↗	locally high S., >8,000 A.
Oystershell Scale	↗	spotty, Central
Pear Thrips	→	low and spotty
Pine Leaf Adelgid	↗	galls on spruce
Pine Needle Rust	→	low
Pine Spittlebug	→	local
Pinewood Nematode	→	local
Porcupine Damage	→	locally high
Red-topped Fir	→	common S Central
Rhabdocline Needle Cast	→	moderate to high
Road Salt Spray	↘	low
Saddled Prominent	→	low/endemic
Saratoga Spittlebug	→	low and spotty
Satin Moth	↑	central, 3,767 A.
Scleroderris Canker	→	low
Spider Mites	→	high, local
Spruce Beetle	↗	high Central coast, 3,225 A.
Spruce Budmoth	→	low and local
Spruce Budworm	→	low/endemic
Stillwell's Syndrome	→	low and local
Variable Oakleaf Caterpillar	↗	low/endemic
White Pine Blister Rust	→	low
White Pine Drought Damage	↗	high-S-1995 drought related
White Pine Weevil	→	high locally severe
Winter Browning	→	low
Yellowheaded Spruce Sawfly	↘	scattered pockets

* damage levels: ↗- up slightly; ↘- down slightly; ↑- up sharply; ↓- down sharply; →- stable at level indicated

(Gray highlight) - Especially notable in 1999

3/00

LIGHT TRAP SURVEY

Maine has had a system of light traps for detecting and monitoring lepidopterous forest pests since 1943. In 1999 a total of 25 Rothamstead (incandescent) and Green River (black light) type light traps were operated at established sites throughout the state (Fig. 1). Twenty two of the traps were operated by contracted operators; three by cooperators. The Arundel trap was operated by Monica Russo, a public cooperator; the Ste. Pamphile trap was cooperatively operated by Seven Islands Land Co.; and the trap in Acadia National Park was cooperatively operated by park service personnel in Bar Harbor as part of a biodiversity project. Trap type and trapping period for each of the trap sites are summarized below.

Table 2. Location, trap type, and period of operation of light traps, 1999 light trap survey

Location	Trap Type	Operation Dates	Location	Trap Type	Operation Dates
Allagash	Rothamstead	July 1-July 30 (30 nights)	Haynesville	Rothamstead	June 17-July 31 (45 nights)
Arundel	black light	May 25-July 9 (46 nights)	Kingfield	Rothamstead	July 1-July 30 (30 nights)
Ashland	Rothamstead	July 1-July 30 (30 nights)	Millinocket	Rothamstead	June 17-July 31 (45 nights)
Bar Harbor*	black light	June 4-July 29 (29 nights)	Mt. Vernon	black light	May 18-July 31 (75 nights)
Blue Hill	Rothamstead	June 17-July 31 (45 nights)	No. Bridgton	Rothamstead	May 18-July 31 (75 nights)
Brunswick	Rothamstead	June 17-July 31 (45 nights)	Rangeley	Rothamstead	June 17-July 31 (45 nights)
Calais	black light	June 17-July 31 (45 nights)	Shin Pond	Rothamstead	July 1-July 30 (30 nights)
Chesuncook	black light	June 17-July 31 (45 nights)	So. Berwick	Rothamstead	May 18-July 31 (75 nights)
Dennistown	Rothamstead	July 2-July 31 (30 nights)	Ste. Aurelie	Rothamstead	July 1-July 30 (30 nights)
Elliotsville	Rothamstead	June 17-July 31 (45 nights)	Ste.Pamphile *	Rothamstead	June 23-August 31 (70 nights)
Exeter	Rothamstead	June 17-July 31 (45 nights)	Steuben	black light	June 17-July 31 (45 nights)
Greenbush	Rothamstead	June 17-July 31 (45 nights)	Topsfield	Rothamstead	Not operated in 1999
Guerette	Rothamstead	July 1-July 30 (30 nights)	Washington	Rothamstead	May 18-July 31 (75 nights)

*** Intermittent operation**

The trapping periods target potential forest pests for each specific site and forest type. Traps used to monitor spruce-fir insects were operated for thirty (30) days from July 1 to July 30; traps monitoring hardwood or hardwood-softwood insect pests were operated for forty five (45) days from June 17 to July 31; traps monitoring the spring hemlock looper, *Lambdina athasaria* and other early hardwood or hardwood-softwood insect pests were operated seventy five (75) days from May 18 to July 31. The Topsfield trap was not operated this year since the operator was in the process of moving.

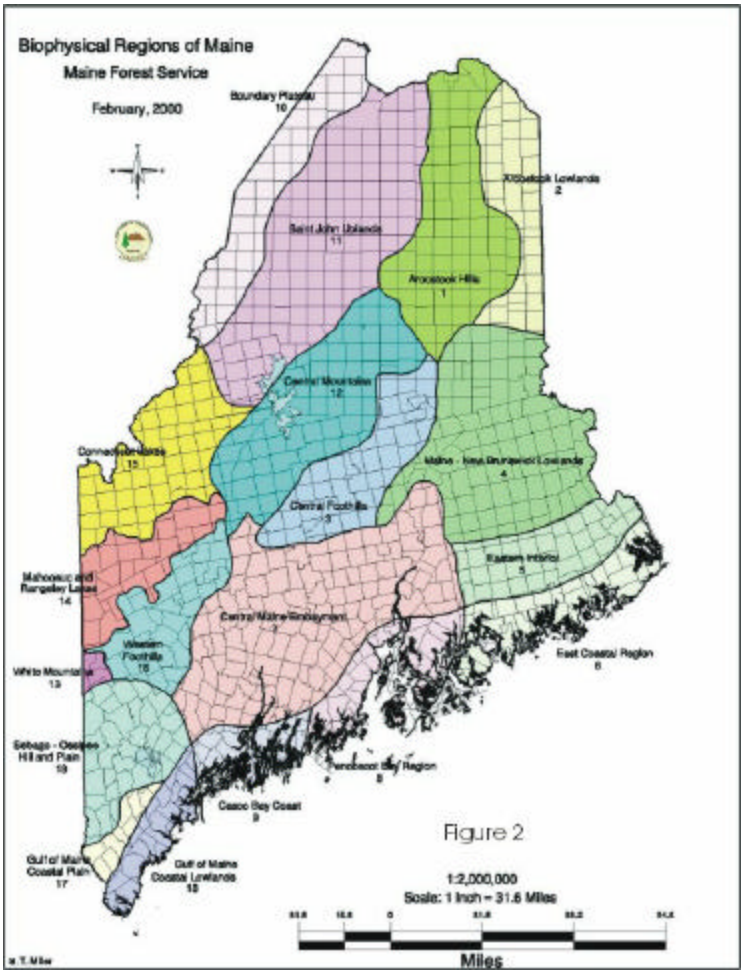
With the exception of Mt Vernon & Steuben, all trap catches were processed at the Insect and Disease Laboratory during the season as they were received. The Steuben trap catches were processed at Steuben by Michael Roberts, the trap operator. The Mt.Vernon catches were processed by Richard Dearborn. Trap catches of most of the major pests being monitored are summarized in Table 3. Further results of the light trap survey are included in summaries of various pests discussed in the body of this report.

Figure 1

Table 3. Comparison summary of light trap survey collections of forest pest species, 1999

	Species								
Location	***Choristoneura conflictana***	***Choristoneura fumiferana***	***Dryocampa rubicunda***	***Heterocampa guttivata***	***Leucoma salicis***	***Lochmaeus manteo***	***Lymantria dispar***	***Malacosma disstria***	***Symmerista* spp.**
Allagash	0	0	0	0	0	0	0	6	0
Arundel*	0	0	109	0	0	6	0	19	0
Ashland	0	0	0	0	0	0	0	35	0
Bar Harbor	0	0	10	5	0	4	0	12	2
Blue Hill	0	1	19	1	0	15	0	14	0
Brunswick	0	2	2	0	0	2	9	4	1
Calais	0	0	24	0	0	4	0	5	3
Chesuncook	0	0	0	8	0	18	0	8	1
Dennistown	0	0	0	0	0	0	0	6	0
Elliotsville	0	0	3	0	0	15	0	16	3
Exeter	0	19	0	2	0	10	1	3	5
Greenbush	0	0	0	0	1	3	0	35	1
Guerette	0	0	0	0	4	0	0	4	0
Haynesville	0	0	0	0	0	0	0	11	2
Kingfield	0	1	0	0	0	9	9	29	0
Millinocket	0	1	1	0	0	12	3	6	2
Mt. Vernon	0	1	19	18	0	1	0	37	32
No. Bridgton	0	3	15	0	0	1	0	3	7
Rangeley	0	1	0	3	0	0	0	7	0
Shin Pond	0	0	0	0	0	12	0	92	1
South Berwick	1	2	100	4	0	34	9	16	33
Ste. Aurelie	0	0	0	0	0	0	1	18	0
Ste. Pamphile	0	0	0	0	18	0	0	89	0
Steuben	0	0	7	0	0	0	1	1	0
Topsfield Washington	3	13	38	4	0	26	0	14	28
Total Moths	**4**	**44**	**347**	**45**	**23**	**172**	**33**	**490**	**121**

* Intermittent/incomplete operation



Phenology

Tracking insect and disease development and trying to correlate this to host development and climatic events is at best a juggling game. Over the years we have kept records on a variety of items and now with computerization of many of our records some association may become evident. Although survey procedures are changing, there is increasing interest in assigning quantifiable impact assessment to climatic events. The drought of 1995 continues to leave its mark on some stands, especially white pine on sandy sites. The severe ice storm events of January 1998 also have had an impact that will take years to evolve as well. Drought-like conditions in many areas of the state in July and August of 1999 followed by excess moisture in September and October and a much milder than normal period through December may also prove to be significant weather events. And more relationships between different events are sure to evolve.

In keeping with past practices we continue to use a biophysical region system in breaking the state into logical compartments. Since Janet McMahon first developed a system of regions specifically for Maine in 1990 there have been a number of modifications. The integration of her system with the national system proposed by Keys and Carpenter in 1995 resulted in the plan now set forth by the Maine State Planning Office (McMahon, Janet 1998 (July). An Ecological Reserves System Inventory. Augusta, Me. Me. State Planning Office. 122 pp.). This is the system shown in Fig. 2. All records in FH&M's Collections and Historical databases can be queried using this regional system.

INSECT Problems Associated With Trees in 1999

(A) Softwood Insect Pests

Adelgids (various) - These insects are often incorrectly referred to as aphids and they are closely related. Adelgids are generally considered more serious tree pests than aphids, however, and are more difficult to control as well. More than ten species of adelgids occur in Maine. Three of these; the **balsam woolly adelgid**, **eastern spruce gall adelgid** and the **pine bark adelgid** complete their entire life cycle on a single host. Most if not all of the others require two conifer hosts with a species of spruce being the gall bearing host. Among this second group it is the **Cooley spruce gall adelgid** and the **pine leaf adelgid** which generate the most concern, primarily in regard to damage to the non spruce host. The infamous **hemlock woolly adelgid** was accidentally introduced into Maine (pp. 3, 16, 59) in 1999 but has not become established so far as we know.

Aphids (especially *Cinara* spp.) - These very gregarious, usually dark, aphids were locally abundant again in 1999. Most reports received were from balsam fir, spruce and eastern white pine. One of the more interesting infestations involved a commercially sold Christmas tree in Scarborough. Just as it was about to be moved inside a few days before Christmas it was found to be literally covered with thousands of aphids of all sizes and accompanied by sooty mold fungus. The aphids had apparently continued to propagate due to the warmer than usual fall weather.

Arborvitae Leafminer (a complex of four species) - Populations rose slightly overall in 1999 with some spots of moderate defoliation evident in Hancock, Kennebec, Penobscot, Waldo and Washington counties. Some stands in Hancock, Kennebec, and Washington counties seem to be experiencing increasing levels of mortality following several years of defoliation.

Balsam Fir Sawfly (*Neodiprion abietis*) - Populations remain very low.

Balsam Gall Midge (*Paradiplosis tumifex*) - Gall midge populations literally "exploded" statewide in 1999 especially in untreated plantations and in understory woodland balsam fir. Many wild fir looked scorched by fall with as much as 90% of the new growth affected. Most "tippers" found it difficult to find suitable brush for garlands, sprays and wreaths. Nearly 2,000 wreaths were rejected and returned by California as a result of being infested by either the gall midge or its **inquiline**, *Dasineura balsamicola*.

Balsam Shoot Boring Sawfly (*Pleroneura brunneicornis*) - Balsam shootboring sawfly population levels were low in 1999, their off-year for damage to balsam and fraser fir. Sawflies could be found in all locations where there was damage in 1998 but there was minimal damage this year. A number of growers monitored sawfly populations in their plantations in 1999 in cooperation with the FH&M Division. Yellow sticky cards were hung in trees in infested areas of their plantations during mid April to early May. The cards catch adult sawflies and alert growers to their presence.

Balsam Twig Aphid (*Mindarus abietinus*) - This perennial problem of balsam fir was common again statewide and sticky twisted needles presented a whitish cast to untreated, unsheared trees by late June. The severity of this problem was dwarfed, however, by the gall midge.

Balsam Woolly Adelgid (*Adelges piceae*) - This introduced species is a perennial problem in Maine but has been a concern primarily of homeowners and landscapers. The gout phase of this adelgid continues to kill and deform fir in coastal areas from Brunswick to Calais. In areas where **spruce decline** (p. 55) has taken out much of the spruce, the BWA can remove another layer of the evergreen, coniferous strata leaving a rather bare site. Infestations of the gout phase also plague some Christmas tree growers and may become more serious if our mild winters continue. This is a serious problem to growers in Nova Scotia.

In 1999 we also received reports of infestations of woodland fir by the woolly trunk phase across southern Piscataquis and central Penobscot counties. In at least two areas, these infestations were accompanied by bark beetle attack and mortality after only a couple of years. Probably <500 acres were affected by this scenario. Although down considerably from the more extensive trunk phase populations in southern Maine in the 60's, this could change with climate moderation.

Bark Beetles (various) - Bark beetle populations tend to fluctuate greatly in response to the availability of susceptible host trees. During 1999 we encountered a number of species in isolated situations and in preliminary bark beetle surveys for the **pine shoot beetle**, which has not yet been found in Maine!! Species found in association with declining red and white pine were the **pine engraver** and ***Pityogenes hopkinsi***. The **eastern larch beetle** and **spruce beetle** continued to infest stressed larch and spruce trees respectively. A variety of other species were encountered locally.

Conifer Sawflies (various) - Although there are more than fifteen different sawflies which may occur on conifers in Maine, only three caused noticeable defoliation during the 1999 season. The **yellowheaded spruce sawfly, larch sawfly** and the **introduced pine sawfly** again dominated the scene. Most of the remaining species such as the **balsam fir** and **jack pine sawflies** produced only light or very local (often involving single trees) feeding during this period.

Eastern Larch Beetle (*Dendroctonus simplex*) - Populations of this opportunist increased somewhat in 1999 especially in Hancock and Washington counties. Spotty mortality was observed throughout the state. Increased stress to larch (see larch stressors p. 17) may result in further increases in future years.

Eastern Pine Looper (*Lambdina pellucidaria*) - This pest of pitch pine has not yet become a problem in Maine as it has further south although the species does occur here. Defoliation is much more severe when high populations of this species occur coincidentally with those of the **pine needleminer** (*Exoteleia pinifoliella*). Needleminer populations were relatively low in Maine in 1999.

Eastern Spruce Gall Adelgid (*Adelges abietis*) - This is a perennial and often severe problem in Maine and annually causes heavy gall production and shoot mortality, especially on white and Norway spruce in plantations and ornamental situations. Trees seem to exhibit varying degrees of susceptibility to this adelgid. The most susceptible trees may not die but growth will be greatly retarded and annual treatment is necessary to maintain high aesthetic value. It may be best in the case of highly susceptible trees to simply remove and/or replace them.

European Pine Shoot Moth (*Rhyacionia buoliana*) - This species seems to be increasing in numbers and distribution. Several "new" infestations were spotted in 1999 on red pine totaling <100 acres primarily in Lincoln, Sagadahoc, Waldo and extreme southern Penobscot counties. Some tip mortality was noted.

Fir Coneworm (*Dioryctria abietivorella*) - Damage by this species was spotty and generally light in 1999.

Hemlock Borer (*Melanophila fulvoguttata*) - The hemlock borer and **Armillaria root rot** continue to take out stressed hemlock locally but there was little change in the incidence of these secondary hemlock problems in 1999. This could change if hemlock looper populations and damage continue to increase especially in conjunction with **drought**. Declining hemlock are also frequently infested with **carpenter ants** which are simply opportunists taking advantage of ideal nesting sites in the sapwood and heartwood.

Hemlock Loopers (***Lambdina athasaria* and *L. fiscellaria***) - No damage was observed and few reports of significant larval activity were received in 1999 but sightings and coincidental trapping of **fall-flying hemlock looper** (*Lambdina fiscellaria*) moths were up sharply. Division staff observed and received numerous reports of looper moth activity in the forests of east coastal, central, and northern Maine from early August through October. In addition to anecdotal reports, large numbers of looper moths were caught in spruce budworm and gypsy moth pheromone traps that were deployed during the looper flight period. Budworm and Gypsy moth traps placed in several central and northern Maine locations caught in excess of 100 looper moths. The highest moth catches (> 300 moths) were from budworm traps placed in north central Maine. Due to this unusual looper moth activity, increased surveys for hemlock looper larvae and damage are planned for the summer of 2000. Increased larval activity was also observed in June in areas where moth catches were elevated.

Populations of the **spring-flying hemlock looper** (*L. athasaria*) were down in 1999 (Table 4). This was concurrent with few reports of looper activity in southwestern Maine, the more common range for this sibling species. **Hemlock needleminer** (*Coleotechnites* spp.) activity in southwestern hemlock stands did appear to increase somewhat in 1999.

Table 4. Total number of spring-flying hemlock looper *(Lambdina athasaria)* moths collected at light, 1992-1999

Location	Year							
	1992		1993	1994	1995	1996	1997	
Arundel			10	0	7	1	1	1
Mount Vernon	2	7	11	5	4	3	2	0
North Bridgton	81	34	49	152	272	320	106	38
South Berwick	1	0	6	0	2	3	2	12
Washington	0	0	0	6	0	0	2	0
Total No. of Moths	**84**	**41**	**76**	**163**	**285**	**327**	**113**	**51**
Total No. of Traps	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**

Hemlock Woolly Adelgid (*Adelges tsugae*) - This species has now been found in Maine. The Maine Forest Service and the Maine Department of Agriculture have been monitoring the status of this pest for several years and maintain a joint quarantine regulating the importation of hemlock products from infested areas (**Quarantines** p. 59). A report brought to our attention in 1999 led to the discovery of infested nursery stock (see p. 3). The hemlock woolly adelgid (HWA) was found in York in few hemlock trees from a Maine nursery in late August. It was also found in a couple of trees in a nursery in Rockport in early September. The two Maine nurseries had purchased their trees from the same Connecticut grower earlier in the spring. Some of the trees were apparently lightly infested at the time of shipment to Maine. All hemlocks remaining in the two nurseries were destroyed. An extensive effort was undertaken in September and October to locate and treat the outplanted trees. Public response to HWA pest alerts in our newsletter, in newspapers and television news announcements was very supportive and enabled the Maine Forest Service to locate and destroy the majority of the outplanted hemlocks. Field surveys were performed in areas where trees had been outplanted to locate and inspect native hemlocks as well. To date there is no indication that populations have yet spread to native stands. Out of 165 trees purchased from the CT grower, 19 are still unaccounted for. The Maine Forest Service and the Maine Department of Agriculture continue to seek these remaining nursery specimens. During late winter, when HWA sacs are filled with eggs and most prominent, FH&M will be conducting intense field surveys in areas where the infested hemlocks were known to have been outplanted.

Introduced Pine Sawfly (*Diprion similis*) - Cocoons of this species were very abundant on a variety of substrates going into the winter of 1998/99 but as the adults began emerging in late April of 1999 it soon became evident that natural enemies had begun to take their toll. In most stands, mortality rates of overwinter sawflies was running 30-75% or higher. Predation and parasitism appeared to be the most important control factors although diseases were also involved. Light populations with some hot spots could still be found in the areas infested in 1998 but 1999 defoliation overall was light.

Jack Pine Budworm (*Choristoneura pinus*) - Moth activity of this species seemed to increase in light traps in Mt. Vernon (Kennebec county) and Steuben (Washington county) in 1999. Primarily white pine occurs near the Mt. Vernon trap. Jack, red and white pine occur at the Steuben site. No defoliation was observed.

Jack Pine Sawfly (*Neodiprion pratti banksianae*) - Populations of this species remained a chronic problem in 1999 as they have for several years. Spotty defoliation of mature jack pine occurred in coastal areas of Hancock and Washington counties from Mt. Desert to Steuben. Most of the infested trees were again on rocky, poor growing sites and stunted. These trees frequently had other problems as well such as the **northern pitch twig moth** (p. 17) and **pine-pine gall rust** (p. 53).

Japanese (Cedar) Longhorned Beetle (*Callidiellum rufipenne*) - This introduced insect has not yet been found in Maine. Ornamental arborvitae should be monitored for this woodboring species especially if purchased from stock shipped in from out of state within the past five years. Suspected infestations should be reported to the State Horticulturist (Ph. (207) 287-3891) or the Insect and Disease Lab.

Larch Casebearer (*Coleophora laricella*) - Defoliation of larch early in the season by this species was again common in 1999 as it has been since 1994. While "scorching" of infested trees was spotty, yellowing of foliage by lower numbers of larvae was more widespread. The most notable changes occurred in Hancock and Washington counties where casebearer feeding mixed with that of other defoliators resulted in very thin larch (see **Larch Stressors** p. 17).

Larch Sawfly (*Pristiphora erichsonii*) - Larch sawfly feeding activity was observed in a number of stands in central and eastern Maine in 1999. Most of the 1999 defoliation occurred near or within stands which were defoliated in 1998 and the level of defoliation was similar. However in 1999 larvae appeared over a longer period of time than usual and mapping of defoliation was hampered due to conflicting evaluation of damage by other stressors such as bark beetles, casebearer, diseases and drought (see **Larch Stressors**) at the time aerial surveys were conducted.

Larch sawfly has caused heavy defoliation in scattered larch stands since the current outbreak began in 1995. Defoliation has varied from year to year but the hardest hit stands have been in central Penobscot, southeastern Piscataquis, southern Aroostook, Hancock and Washington counties. Nearly complete defoliation of larch for two successive seasons has caused branch, top, and whole tree mortality in several areas.

Larch Stressors - Larch Sawfly (*Pristiphora erichsonii*), Eastern Larch Beetle (*Dendroctonus simplex*), Larch Casebearer (*Coleophora laricella*) and Variable Water Levels - Native eastern larch and some larch hybrids have been under serious stress from several pests and significantly fluctuating water levels in the recent past especially during 1995 and 1999. During 1999 combinations of these agents resulted in significant larch mortality in pockets and to individual trees throughout eastern Maine. Approximately 10,800 acres of seriously defoliated, discolored, and dead larch were mapped. In addition to this mapped acreage, scattered individual larch and small clusters of stressed or dead trees were seen throughout eastern and northeastern Maine (a gross area of over 1.2 million acres). Nearly all stands mapped in 1999 contained examples of all of the stressors listed.

Most larch stands occur on relatively wet sites that have been through alternate periods of drought and then flooding. Further stress has been caused by a variety of defoliators such as those listed. As a result pockets of larch beetle mortality have showed up as they did during the 1999 survey. These pockets of mortality ranged in size from several trees to several acres. In late summer these pockets could be identified by the presence of dead trees surrounded by recently attacked trees that were prematurely yellow.

In addition, several mapped areas appear to have been killed directly by fluctuating water levels. Between 1995 and 1999 Maine has experienced water levels that have ranged from severe drought to flood levels during the summer growing season. This variability has certainly had an impact.

Northern Pine Weevil (*Pissodes approximatus*) - The northern pine weevil occurs throughout the state on a variety of pines and spruces. Normally considered a secondary problem, it can become more aggressive when numbers build following logging or storm damage. In recent years a series of **droughts** and other stressors have predisposed stands of red and white pine to weevil and bark beetle attack. Like bark beetles such as the **pine engraver** and ***Pityogenes hopkinsi***, the northern pine weevil is an opportunist which is always ready to take advantage of a stressed stand. A number of infestations were reported in 1999.

Northern Pitch Twig Moth (*Petrova* = *Retinia albicapitana*) - "Gobs" of pitch containing larvae or pupae of this species were still very common and unsightly on twigs and branches of jack pine especially in Hancock and Washington counties. Most of these pitch masses were at the base of small branches or around buds. Damage by this insect is usually limited to minor twig and branch mortality and the unsightly pitch masses. This species has a two year life cycle. Further north this species seems to be less common. In plantations in west central Maine it is the **jack pine resin midge** (*Cecidomyia resinicola*) which causes much of the resinosis (see Summary Rpt. #10 p. 15).

Pales Weevil (*Hylobius pales*) - Few reports of pales weevil activity were received in 1999.

Pine Bark Adelgid (*Pineus strobi*) - This continues to be a local problem especially on stressed urban trees.

Pine Engraver (*Ips pini*) - This widespread species breeds in all species of pine and spruce in Maine and, being an opportunist, will take advantage of stressed trees. Heavy populations can successfully invade healthy trees. Pine engraver populations were still active in red and some white pine stands infested in 1998 which were also infested with the **northern pine weevil**.

Pine False Webworm (*Acantholyda erythrocephala*) - This introduced species which has been very destructive to white and red pines over thousands of acres in upstate New York has still not appeared in Maine.

Pine Gall Weevil (*Podapion gallicola*) - This insect continues to show up wherever red pine is found. It is seldom a serious problem, however, branches of some trees may have sufficient numbers of galls to cause branch mortality.

Pine Leaf Adelgid (*Pineus pinifoliae*) - Galls appeared as expected on red and black spruce in 1999. Populations and damage were spotty but up slightly.

Pine Needleminer (*Exoteleia pinifoliella*) - This species is primarily a pest of jack and pitch pine in Maine. Although damage has been locally heavy in southwestern Maine in the past, populations remained generally low in 1999. When populations of this species are high in conjunction with those of the **eastern pine looper**, defoliation can be severe.

Pine Needle Scale (*Chionaspis pinifoliae*) - This species is a perennial pest on a wide variety of conifers. Populations always seem heaviest on Scotch and mugo pine in Maine and thus the problem is more oriented to urban and occasionally plantation situations.

Pine Root Collar Weevil (*Hylobius radicis*) - No further reports of activity by this species were received in 1999. It so far remains a relatively rare problem associated with Austrian, red and Scotch pine nursery stock in southwestern Maine.

Pine Shoot Beetle (*Tomicus piniperda*) - Even though this species has now been found in northeastern Vermont, northwestern New Hampshire and eastern Quebec we have still not found it in Maine. Due to increasing concerns, a possible quarantine arrangement will likely evolve early in 2000 (see **Quarantines** p. 3 & 58).

The common pine shoot beetle was not found in a trapping survey performed in western Maine during the spring and early summer of 1999. A total of twenty 8-unit funnel Lindgren traps baited with an alpha-pinene lure were placed in eight towns in Franklin County and one town in Oxford County during early and mid April. Most trap sites were on the edges of red pine plantations or natural stands from Adamstown along Routes 16 east to Eustis and north along Route 27, a major travel route, to Coburn Gore Customs at the Canadian border. One trap was placed next to a log yard and another was placed next to a golf course with planted Scotch pine trees. Traps were checked weekly and retrieved during the first and second weeks of July.

Pine Spittlebug (*Aphrophora parallela*) - Spittle masses containing the pale yellow and black nymphs of this species were again abundant on a variety of conifers in 1999. Populations changed little from 1997 levels and were locally heavy on mugo, Scotch and eastern white pine.

Pitch Mass Borer (*Synanthedon pini*) - Large globs of pitch, containing reddish brown frass and wood chips, covering larval workings of this clearwing moth seemed to be common in 1999 on the boles of large, usually stressed, white pine and Colorado blue and Norway spruce.

Red Pine Scale (*Matsucoccus resinosae*) - Although we have not yet found this species in Maine it has now been reported from Massachusetts. This serious pest of red pine could move into Maine stands with increasing movement of logs and nursery stock so we will be watching out for it.

Red-topped Fir - The red-topped fir scenario discussed in our last report continued to be visible and caused comment especially along Interstate 95 from Clinton to Carmel. We were able to rear adult specimens from a number of infested tops and all turned out to be **whitespotted sawyer beetles**. We had suspected the **balsam fir sawyer**, *M. marmorator,* but none emerged.

Red Turpentine Beetle (*Dendroctonus valens*) - This continues to be a low-key and very local problem affecting red pine in southern Maine.

Saratoga Spittlebug (*Aphrophora saratogensis*) - No new infested areas were reported in 1999. Very limited areas are currently impacted by this pest in Maine.

Spruce Beetle (*Dendroctonus rufipennis*) - The condition of many of Maine's coastal spruce stands continued a gradual decline in 1999 (see **Spruce Decline** p. 55). The most immediate cause of spruce stand deterioration continues to be spruce beetle but the underlying causes of poor stand condition, in almost all cases, are tree over-maturity, a total lack of stand management, and sites where tree longevity is severely limited by shallow, rocky soils. The current spruce beetle infestation remains confined predominantly to the central Maine coast, especially in and around Penobscot Bay. The area infested by spruce beetle increased slightly in 1999 but the intensity of attack within infested stands appeared to decline. As of November 1999 several Penobscot Bay stands had lost more than 50% of their red and white spruce over 15" in diameter.

Figure 3

Four newly attacked stands were found in 1999 in the Cape Rosier area, Seal Harbor, Bass Harbor, and on islands near Vinalhaven. As of November 1999, 2,760 acres of 30 to 50 percent mortality and 465 acres of greater than 50 percent mortality have been mapped (see Fig. 3). **Drought** conditions in 1999 are likely to add more stress to coastal spruce stands and may result in expansion of the spruce beetle infestation as was seen following the 1995 drought.

Informational meetings, stand evaluations, and recommendations to landowners continued in 1999 but salvage opportunities remain limited by rapid decay and logging and transportation difficulties.

Spruce Budmoth (*Zeiraphera canadensis*) - This chronic problem affecting white spruce varies in intensity from year to year. No noticeable defoliation was observed in 1998 although larvae could be found in low numbers throughout the state.

Spruce Bud Scale (*Physokermes piceae*) - This scale often remains inconspicuous until populations reach high levels and sooty mold and discoloration of growing tips draw attention to the problem. Populations continue to remain locally high on plantation spruce throughout the state especially in Hancock, Kennebec, Waldo and Washington counties.

Spruce Budworm (*Choristoneura fumiferana*) - Monitoring of low level spruce budworm populations continued in 1999 in the form of field observations, a statewide light trap network, and pheromone baited traps that are highly attractive to budworm moths. A total of 35 pheromone trap locations were evaluated for spruce budworm moth activity in 1999, which was four fewer sites than in 1998. Light traps were operated through the budworm flight period at 25 locations statewide (Fig. 1). Spruce budworm moth catches in both pheromone and light traps was the lowest since 1995 (Tables 5 and 7). Lower catches in 1999 ended a three year trend toward increased moth catches and more widespread distribution of the locations where budworm moths were trapped.

A low number of field observations were made by FH&M staff in 1999 but, no larvae were found and no defoliation was detected. Spruce budworm moth catches in the statewide network of light traps (Table 6) was lower in magnitude and distribution to that seen in 1998. Budworm moths were caught at ten of the 25 light trap locations in 1999 compared to catches in 15 of 25 in 1998 and 17 of 26 traps in 1997. The number of budworm caught per trap decreased from 3.4 in 1998 to 1.7 in 1999 making the 1999 catch the lowest since 1995.

Moth catches in pheromone baited traps also decreased sharply in 1999 (Table 7). Budworm moths were caught in only 48% of the traps deployed in 1999 compared to 92 % of traps in 1998 and 70% of traps in 1997. In 1999, moth catch per trap was five or more in only one location compared to 15 locations in 1998 and seven locations with five or more moths in 1997. The highest 1999 catch per trap was eight in Holeb. Ten or more moths were caught in six locations in 1998.

The 1996 to 1998 trend toward increased pheromone and light trap catches had caused an increased interest in spruce budworm population monitoring. One industrial forest landowner cooperated with the FH&M budworm survey effort by placement and retrieval of pheromone traps in additional locations in northern Maine. Moth catches in these additional locations were low with counts similar to traps placed by FH&M staff. This additional survey effort, predominantly in northeastern portions of the state, added valuable data to the FH&M survey.

Table 5. Total number of spruce budworm (*Choristoneura fumiferana)* moths collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	0	1	7	0	2	0	0	0	0
Arundel				0	3	2	0	2	*0
Ashland	0	0	0	0	0	0	1	2	0
Bar Harbor							0		0
Blue Hill	0	0	4	0	0	0	8	0	1
Brunswick	3	0	0	0	1	0	3	6	2
Calais	3	0	0	0	0	0	3	1	0
Chesuncook	1	0	1	0	0	0	2	2	0
Clayton Lake									
Dennistown	0	0	0	0	1	0	0	1	0
Elliotsville	0	0	2	0	1	0	8	5	0
Exeter	4	5	21	16	6	3	4	38	19
Greenbush	1	0	1	0	0	0	0	0	0
Guerette	0	0	0	0	0	0	4	0	0
Haynesville	0	0	0	2	0	2	1	2	0
Kingfield	0	0	2	2	0	1	1	0	1
Matagamon	0	1	2						
Millinocket	1	0	0	0	4	9	11	1	1
Mt. Vernon	0	0	2	1	2	12	2	0	1
No. Bridgton	0	1	0	0	2	0	5	4	3
Rangeley	0	2	8	0	1	0	8	6	1
Shin Pond				0	0	3	1	0	0
South Berwick	0	0	2	0	0	0	0	1	2
Ste. Aurelie	0	0	0	0	0	0	0	6	0
Ste. Pamphile							0	0	0
Steuben	8	0	0	5	0	3	2	0	0
Topsfield	0	0	0	0	1	12	0	0	
Washington	0	6	0	0	0	1	5	9	13
Total Number of	**21**	**16**	**52**	**26**	**24**	**48**	**69**	**86**	**44**
Total Number of	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Table 6. Spruce budworm seasonal light trap summary -

Year	Total # Moths	# Traps	Average # Moths/Trap
1999	44	25	1.7
1998	86	25	3.4
1997	69	26	2.6
1996	48	24	2
1995	24	24	1
1994	26	24	1.1
1993	52	23	2.3
1992	16	23	0.7
1991	21	23	0.9
1990	107	24	4.4
1989	731	22	30.7
1988	209	20	10.4
1987	464	20	23.2
1986	1,365	20	68
1985	13,233	20	661
1984	17,983	20	895
1983	144,673	18	8,037
1982	49,200	20	2,460
1981	39,724	20	1,986
1980	100,537	19	5,291
1979	95,811	16	5,988
1978	220,264	17	12,957
1977	24,212	15	1,614
1976	22,308	16	1,394
1975	149,874	23	6,516
1974	158,784	24	6,616
1973	39,069	24	1,628
1972	15,959	24	665
1971	20,653	25	826
1970	1,076	24	45
1969	5,415	27	201
1968	948	24	39.5
1967	120	26	4.6
1966	51	24	2
1965	83	24	3.5
1964	159	25	6
1963	133	24	5.5
1962	258	23	11.2

Table 7. Spruce budworm pheromone trap catch in Maine - 1994 to 1999**

Location	Year						Location	Year					
	199	*199*	*1996*	*1997*	*1998*	*1999*		*199*	*199*	*1996*	*1997*	*1998*	*1999*
Allagash	<1	<1	1	1	<1	<1	Jonesboro	<1	<1	<1	1	<1	<1
Calais *	<1	<1	<1	1	<1	<1	NE Carry		<1	<1		2	1
Chesuncook	<1	<1	<1	1	3	1	Princeton		<1	<1	1	1	3
Clayton Lake	<1	<1	<1	<1	2	<1	Steuben *	2	2	<1	<1	2	1
Coburn Gore	<1	1	1	3	11	2	St. Pamphile	1	1	<1	<1	4	<1
Connor	<1	<1	2	<1	1	<1	Topsfield *	<1	<1	<1	<1	1	1
Daaquam	<1	<1	1	<1	1	<1	Waltham	4	<1	<1	1	4	1
Dennistown *	<1	1	2	5	14	3	Smith Pond *	<1	<1	<1	5	3	
Dickey	<1	<1	1	<1	1		St Frances	<1	2	3	3	8	<1
Duck Lake	<1	<1	<1		1		Oxbow	<1	<1	1	2	6	<1
Franklin	37	4	<1	3	11	1	Ragmuff			4	1	18	2
Garfield	<1	<1	2	<1	6	<1	Rangeley	2	<1	3			1
Greenbush *	<1	<1	<1	5	10		Ste. Aurelie *	<1	1	12	9	24	<1
Haynesville *	<1	<1	<1	3	7		Matagamon	1	1	2	1	6	<1
NEW TRAPS IN 1997													
Dallas Twp.				2	6	1	Magalloway				3	3	1
Edmonds				<1	1	<1	Parkertown				9	5	2
Grafton				<1	4		Perry				1	1	<1
Holeb				7	8	8	Round Pond				2	3	<1
T11R9				<1	3	<1	T5R16				1		<1
T19R20				<1	<1	<1	T5R20				5	5	<1
Baker Lk.				1	1	<1							

*Light trap locations **These figures reflect a per trap average from a cluster of three traps

Spruce Spider Mite (*Oligonychus ununguis*) - Mites, and in particular the spruce spider mite, are present to some degree on most conifers every year and the characteristic mottling often detracts aesthetically from otherwise lush green foliage. Populations remained generally chronic in 1999 or up somewhat and were locally heavy enough to warrant control on some ornamental conifers and in some balsam fir Christmas tree plantings.

Western Conifer Seed Bug (*Leptoglossus occidentalis*) - Although formerly a pest of seed on western conifers, populations of this true bug seem to have "exploded" eastward over the past ten years and it is now found throughout southwestern Maine. Some range extension was observed in 1999 although not as much as expected (Fig. 4). Our first Maine record was from Mt. Vernon in 1994 although the species was common there at that time. Most Maine records so far involve specimens collected in a variety of buildings from September throughout the winter months. The

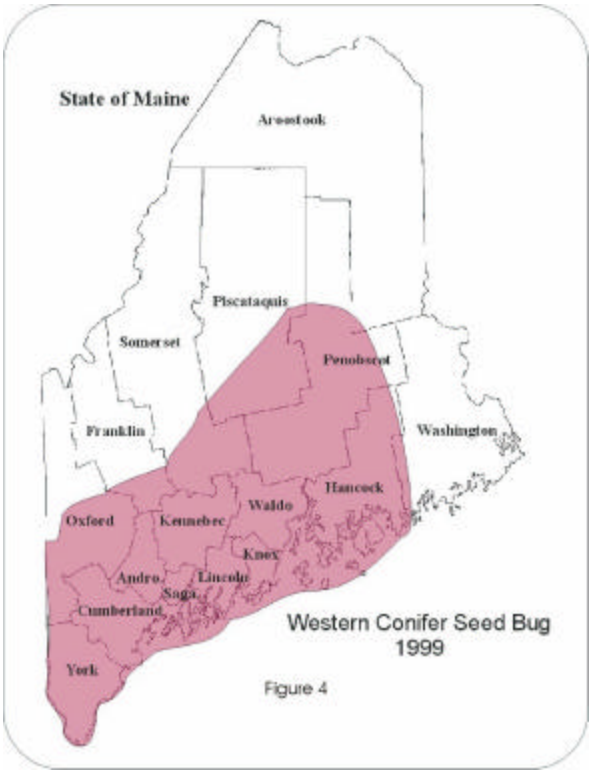


Figure 4

relatively large (3/4"+ long) and attractive adults are camouflaged brownish in color and seldom seen out-of-doors, however, they become easily seen after they enter homes to spend the winter.

The western conifer seed bug can destroy a fairly high number of seeds within developing cones. Although their food (seeds) range is wide, they seem to like pines and Douglas-fir and are especially abundant in homes in or near pine stands. We are not sure as to whether or not this insect will feed on balsam fir, larch or spruce.

Whitemarked Tussock Moth (*Orgyia leucostigma*) - Although this species continues to be somewhat of a problem in nearby Nova Scotia, Maine populations have continued to remain low. Reports in 1999 were limited to individual caterpillars. No significant defoliation was observed.

White Pine Weevil (*Pissodes strobi*) - The white pine weevil is undoubtedly the most economically damaging pest of white pine in Maine, rivaled only by **white pine blister rust** (p. 56). This is one of those chronic problems in most areas and seriously limits growth of good straight white pine unless controlled. Young trees (three to 30 feet in height) normally bear the highest incidence of attack. Although weevil populations remain fairly stable at high levels; annually visible new damage to high value stock fluctuates, due in part to limited availability or improper use of effective, registered pesticides. Corrective pruning will help in the case of ornamental white pine as well as Colorado blue and Norway spruce. Scattered pockets of heavy weevilling were again reported in 1999 but none quite as serious as reported in 1998.

Whitespotted Sawyer Beetle (*Monochamus scutellatus*) - This common woodborer of softwood (conifer) trees seems to have become increasingly abundant across the state in recent years. The interesting black and white beetles with long antennae often cause alarm when they appear at cookouts and on screen doors and woodpiles. The larvae produce striking piles of sawdust near infested wood and their chewing (crunching) can be heard for some distance. Their main source of notoriety is usually the damage the larvae do to logs piled for lumber. When abundant though, this species can kill the tops (see **red-topped fir** p. 18) or entire stressed trees and occasionally beetles will emerge from structural timbers in service. Beetle feeding on the bark of tender shoots can also cause some twig and branch mortality. Adults of this species will only infest dying or recently cut trees with the bark on. Once debarked further infestation by this species is not possible.

Whitespotted sawyer beetles are also causing some concern lately due to their appearance which is similar to the **Asian longhorned beetles**. Once you see the two together they are, however, distinct.

Yellowheaded Spruce Sawfly (*Pikonema alaskensis*) -Yellowheaded spruce sawfly required control measures on 400 acres in western Maine in 1999. Scattered pockets of damage in young black spruce plantations can still be found in western and northern Maine in Franklin, Somerset, Penobscot and Aroostook counties. Individual ornamental and roadside trees across the state continue to exhibit defoliation by this sawfly.

(B) Hardwood Insect Pests

NOTE: This section includes all insect pests of deciduous trees and shrubs in forest, ornamental and urban settings

Alder Insects - Browning of alder was more pronounced in 1999. The most common defoliator was again the **alder flea beetle** (*Altica ambiens alni*). Associated species which were often associated with the browning as well were the **alder leaf beetle** (*Chrysomela mainensis mainensis*) and **Alder sawfly** (*Arge* sp.).

Aphids, Leafhoppers, Treehoppers and Scales (various) - The activities of these "suckers of sap," occasionally a problem as their overflow honeydew drizzled down on cars, were more noticeable in 1999 than in 1998. Our only measure of abundance for these insects is based on the frequency of reports and these were spotty in number.

Ash Flowergall Mite (*Aceria fraxiniflora*) - White ash showing the characteristic bud proliferation resulting from the activities of this mite seemed much more prevalent in 1999 than since the early 90's. Surveys are not done specifically for this pest but comments from staff and a variety of observers indicate that damage is on the rise at least in Kennebec County. Some twig and branch mortality is associated with this activity. For a discussion of this phenomenon see our Summary Report #8 for 1993, p. 33.

Asian Longhorned Beetle (*Anoplophora glabripennis*) - This potentially serious woodboring pest of deciduous trees, especially maples, has still not been found in Maine. The alert sent out to our readers in 1998 is still bearing fruit and we received over 50 inquiries and responded to nearly 40 reports of suspected cases of ALB in 1999. Many of these reports concerned sightings of our common softwood boring **whitespotted sawyer beetle** which somewhat resembles ALB. We also investigated a number of trees/stands infested with the **sugar maple borer**. In one case the infestation appeared so atypical that the sugarbush operator sacrificed a tree to extract the distinctive larval stage. It was definitely sugar maple borer. In this case the infestation was within three feet of the ground, with vertical borings on a flat bark face on a seemingly vigorous sugar maple.

We continue to keep public awareness of the potential seriousness of this problem at a high level to encourage early detection. Please notify the Insect and Disease Lab of any suspected infestations. Any beetles suspected of being this species should be retained for confirmation.

Aspen Problems (various) - Aspen stands were fairly green overall in 1999 except where the ice events occurred (see **ice damage** p. 52). Aspen was one of the most severely impacted tree species in areas affected by the January 1998 ice storms and many trees have since died or been harvested. The only defoliators causing noticeable, but local damage were the **satin moth** and in a few cases a complex of **leaf beetles** and **flea beetles**.

Bark Beetles and Ambrosia Beetles (Scolytidae) - Damage to standing hardwood trees by species of Scolytidae has been generally low in Maine over the years with the notable exception of that caused to American elm by the **native elm bark beetle** (*Hylurgopinus rufipes*) and the **smaller European elm bark beetle** (*Scolytus multistriatus*). Degrade of birch, maple and oak lumber due to activities of several species of **ambrosia beetles** occurs but the reported incidence has been spotty. Following the 1998 ice events monitoring of hardwoods, especially maples, for bark and ambrosia beetles was stepped up. Increased damage by the **eastern ash bark beetle** to standing trees in 1999 seemed to be one response to the ice event.

Barklice or Psocids - "Herds" of these interesting "little cattle" are often very noticeable on the bark of various trees across much of Maine. Although colonies are usually more abundant and evident on hardwoods, they also occur on a variety of softwoods as well. The psocid species most commonly noticed in numbers on tree bark in Maine is *Cerastipsocus venosus.* Barklice feed on lichens and fungi on the tree bark and pose no threat to the trees themselves. Many reports of this phenomenon were received in 1998.

Beech Problems (various) - Beech throughout the state continues its hard struggle for existence and many stands showed extensive wilting, discoloration, deformed foliage and twig dieback in 1999. This was especially true across central and eastern Maine where **beech bark disease** (p. 47) infested trees face **drought** stress, poor sites and locally heavy populations of **oystershell scale** (p. 34). Fortunately most of the lepidopterous defoliators such as the **variable oakleaf caterpillar** did little damage in 1999.

Birch Casebearer (*Coleophora serratella*) - Birch casebearer populations declined in 1999 and were heaviest but spotty on roadside trees and ornamentals.

Birch Leafminer (*Messa nana*) - Populations of this white birch leafminer and those of the **gray birch leafminer** (*Fenusa pusilla*) were both up slightly in 1999.

Birch Skeletonizer (*Bucculatrix canadensisella*) - Populations and damage from this species remained low in 1999.

Bronze Birch Borer (*Agrilus anxius*) - Dead-topped birch resulting from boring activities of larvae of this insect continue to show up where stress of one kind or another exists. Birch on **drought**-prone sites, recently thinned woodlots and "abused" landscape situations are most susceptible. Once birch are infested with this borer there is little that can be done to prevent eventual tree mortality. Increases in bronze birch borer populations in some trees hit by the 1998 **ice storm** were evident in 1999.

Browntail Moth (*Euproctis chrysorrhoea*) - High population levels of the browntail moth continued to cause problems for residents of the Casco Bay area (Portland to Small Point) in 1999. While numbers of browntail were very high in northern portions of the Bay, those in many of the outlying areas of the infestation from Kittery to Gouldsboro, including the islands in the southern half of the Bay, exhibited a general decline. Data from the winter web survey in 1999 showed a continuing trend for this pest to move from southern to northern portions of Casco Bay. This shift provided relief to residents of Portland islands while distressing hundreds of residents in Freeport and Harpswell. The infested area remained fairly stable in 1999 with slight increases north and inland (Fig. 5). This is also reflected in the jump in moth catches in the Brunswick area (Table 8).

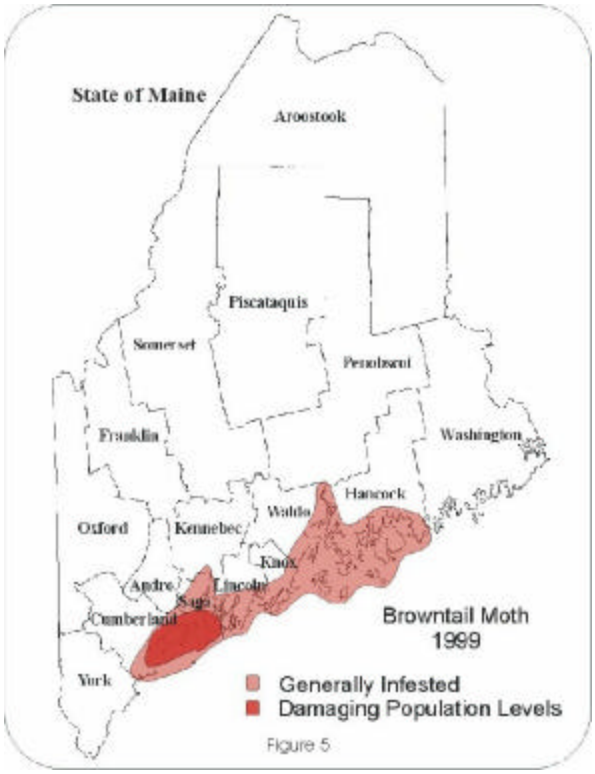


Figure 5

Table 8. Total number of browntail moths *(Euproctis chrysorrhoea)* collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	0	0	0	0	0	0	0	0	0
Arundel				0	0	0	0	0	*0
Ashland	0	0	0	0	0	0	0	0	0
Blue Hill	0	0	0	1	0	0	0	0	0
Bar Harbor							*0		0
Brunswick	4	1	1	1	59	101	54	120	245
Calais	0	0	0	0	0	0	0	0	0
Chesuncook	0	0	0	0	0	0	0	0	0
Clayton Lake									
Dennistown	0	0	0	0	0	0	0	0	0
Elliotsville	0	0	0	0	0	0	0	0	0
Exeter	0	0	0	0	0	0	0	0	0
Greenbush	0	0	0	0	0	0	0	0	0
Guerette	0	0	0	0	0	0	0	0	0
Haynesville	0	0	0	0	0	0	0	0	0
Kingfield	0	0	0	0	0	0	0	0	0
Matagamon	0	0	0						
Millinocket	0	0	0	0	0	0	0	0	0
Mt. Vernon	0	0	0	0	0	0	0	0	0
No. Bridgton	0	0	0	0	0	0	0	0	0
Rangeley	0	0	0	0	0	0	0	0	0
Shin Pond				0	0	0	0	0	0
South Berwick	0	0	0	1	0	0	0	0	0
Ste. Aurelie	0	0	0	0	0	0	0	0	0
Ste. Pamphile							0	*0	0
Steuben	0	0	0	0	0	0	0	0	0
Topsfield	0	0	0	0	0	0	*0	0	
Washington	0	0	0	0	0	0	0	0	0
Total Number of Moths	**4**	**1**	**1**	**3**	**59**	**101**	**54**	**120**	**245**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* intermittent/incomplete operation

Municipal control projects were conducted in five towns in 1999 using aerially applied tebufenozide (Confirm 2F) on a total of 5120 acres. The acreage was broken up as follows: Falmouth - 995 ac., Cumberland - 886 ac., Yarmouth - 884 ac., Freeport -320 ac., Bustins Island (Freeport) - 92 ac. and Harpswell - 1943 ac. Immediate knockdown was not as high as hoped for but some amount of relief was achieved in most treated areas. Many insects reached the final instar which increased the amount of medical problems (**rash**) but there was very high mortality of the larvae within the treated areas during the final instar. It appears that, even though the mortality occurred many days after the application, the insects had succumb to stress induced by the insecticide as these losses were not seen outside the treated areas. The effect of this reduction can readily be seen in reduced numbers of overwintering webs and should be reflected in a very large drop in acreage needing control in 2000.

The annual aerial survey of defoliation caused by browntail moth larvae found 2187 acres of 30% or greater leaf loss. This acreage number was suppressed in 1999 because many of the heavily infested lands were included in municipal control projects.

The winter survey used to predict spring 2000 populations of browntail is underway and much of the area known to support high population levels has already been examined. It now appears that browntail control will be recommended on approximately 2,400 acres in Brunswick, Freeport and Harpswell. This figure may change as more data is collected. Also, winter mortality will be assessed prior to the establishment of final treatment blocks which could result in a reduction in control acreage. Confirm 2F will be the preferred insecticide for the bulk of this work due to its lack of impact on the marine environment although the option to use Dimilin 4F on lands set back from the water will also be pursued. Dimilin provides more flexibility than Confirm 2F in the timing of control applications. This is important when weather or equipment problems delay treatment.

Bruce Spanworm (*Operophtera bruceata*) - While it was not difficult to detect larvae, defoliation by this species continued to decline in 1999 and was generally very light and spotty. Moths were again fairly common in late fall (see **Hunter's moths** p. 30), however.

Cherry Scallop Shell (*Hydria prunivorata*) - This nesting or tent-making geometrid causes damage to cherry south of Maine but populations in Maine remain rather low and spotty.

Eastern Ash Bark Beetle (*Hylesinus aculeatus*) - This species is common statewide and profuse production of powdery sawdust from its workings can be seen in most woodpiles or on stressed and dying ash. Little change in numbers was noted in 1999. Tree boles infested with the overwintering beetles were more common than usual in 1999 in stands exhibiting **ice damage.** See our last summary report (# 13) for more information (p. 25).

Eastern Tent Caterpillar (*Malacosoma americana*) - Early season tents of this species were evident across the state in June as usual but, except for a very few hot spots, numbers were low in 1999.

Elm Flea Beetle (*Altica carinata*) and Elm Leaf Beetle (*Pyrrhalta luteola*) - Defoliation of elm by either or both of these species was low and local in 1999.

European Chafer *(Rhizotrogus* (= *Amphimallon*) *majalis*) - Unconfirmed reports of swarming activity at dusk by what appears to be this species were received from York and Augusta in 1999. If confirmed these should be new Maine records.

Fall Cankerworm (*Alsophila pometaria*) - The only notable activity by this species continues to be on boxelder in eastern Aroostook County. This infestation continued its decline and was low and spotty again in 1999. See **Hunter's moths** (p. 30).

Fall Webworm (*Hyphantria cunea*) - Populations of and damage by this species were extremely high in 1999 especially in southwestern Maine (Cumberland, York and southern Oxford counties). Many trees were totally stripped and webbed by mid August. As this phenomenon occurred simultaneously with the summer drought period, some tree mortality is expected! High, but not as high, defoliation occurred in many other areas of the state as well. More than 10,000 acres was affected.

Forest Tent Caterpillar (*Malacosoma disstria*) - Populations were low and endemic in 1999. No defoliation was observed. Numbers of moths in our light trap survey did rise very slightly however (Table 9).

Table 9. Total number of forest tent caterpillar (*Malacosoma disstria)* moths collected at light

Location	Year 1991	1992	1993	1994	1995	1996	1997	1998	1999
Allagash	39	54	78	64	27	8	4	0	6
Arundel				82	150	39	18	20	*19
Ashland	122	124	169	117	157	57	33	51	35
Bar Harbor							*0		12
Blue Hill	27	43	47	221	62	17	4	2	14
Brunswick	69	17	9	35	32	33	6	8	4
Calais	11	23	279	52	28	3	1	3	5
Chesuncook	0	1	0	2	1	0	0	0	8
Clayton Lake									
Dennistown	37	58	44	89	79	10	10	18	6
Elliotsville	49	78	55	53	145	18	15	3	16
Exeter	1	2	1	8	4	0	1	0	3
Greenbush	56	24	30	87	95	149	41	24	35
Guerette	28	8	12	32	18	4	5	14	4
Haynesville	56	36	45	176	64	9	6	2	11
Kingfield	4	18	20	97	95	32	20	13	29
Matagamon	63	126	56						
Millinocket	20	43	7	73	75	0	0	2	6
Mt. Vernon	32	107	39	187	192	46	28	23	37
No. Bridgton	115	153	297	223	102	51	9	5	3
Rangeley	81	47	48	57	11	3	2	1	7
Shin Pond				124	217	30	72	110	92
South Berwick	352	324	377	371	195	91	31	26	16
Ste. Aurelie	18	13	9	28	15	6	5	16	18
Ste. Pamphile							*25	*37	89
Steuben	9	0	2	169	11	7	2	4	1
Topsfield	28	45	102	178	40	14	*0	24	
Washington	23	36	53	111	41	45	16	4	14
Total Number of Moths	**1,240**	**1,380**	**1,779**	**2,636**	**1,856**	**672**	**329**	**373**	**490**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Greenstriped Mapleworm (*Dryocampa rubicunda*) - Larval populations of this species remained low in 1999 and no defoliation was reported. This species is primarily a feeder on red maple in Maine. Numbers of the familiar pink and yellow adults, the **rosy maple moth**, dropped noticeably in 1999 (Table 10).

Table 10. Total number of greenstriped mapleworm (*Dryocampa rubicunda)* moths collected at light

Location	Year 1991	1992	1993	1994	1995	1996	1997	1998	1999
Allagash	0	0	2	0	0	0	0	0	0
Arundel				468	531	130	208	402	*109
Ashland	0	0	1	0	0	0	0	0	0
Bar Harbor							*0		10
Blue Hill	24	46	104	46	113	30	120	19	19
Brunswick	13	16	4	27	20	8	10	4	2
Calais	7	4	13	29	240	19	79	41	24
Chesuncook	4	1	3	8	51	3	20	2	0
Clayton Lake									
Dennistown	0	1	1	5	1	2	1	0	0
Elliotsville	7	11	14	30	103	18	39	12	3
Exeter	1	1	3	9	7	2	2	4	0
Greenbush	10	12	13	14	48	34	60	11	0
Guerette	0	0	0	0	0		0	0	0
Haynesville	8	2	8	12	34	5	23	24	0
Kingfield	0	0	0	0	0	4	0	0	0
Matagamon	0	0	0						
Millinocket	8	27	38	66	93	23	120	0	1
Mt. Vernon	24	18	5	11	32	16	3	18	19
No. Bridgton	4	6	2	6	24	20	8	10	15
Rangeley	0	0	1	0	0	0	0	0	0
Shin Pond				0	1	1	7	0	0
South Berwick	41	373	340	189	276	171	110	189	100
Ste. Aurelie	0	0	0	0	0	1	2	0	0
Ste. Pamphile							2	0	0
Steuben	42	84	22	33	56	11	36	27	7
Topsfield	20	12	31	37	133	24	0	1	
Washington	89	48	90	101	181	34	24	30	38
Total Number of Moths	**302**	**662**	**695**	**1,091**	**1,944**	**556**	**874**	**794**	**347**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent /incomplete operation

Gypsy Moth (*Lymantria dispar*) - Gypsy moth activity has been very scarce in recent years in Maine due primarily to mortality from the fungus *Entomophaga maimaiga*. No defoliation was found during summer aerial surveys for the second consecutive year (Table 12). Egg mass levels have continued to be very low statewide as well, making it impossible to run parasitism and winter survival checks as we have in the past In addition, few moths were collected in our light trap survey, down from 1998 (Table 11). Although the potential for increases is there as seen in pheromone catches of male moths, no significant increase in the population level of this pest is expected in 2000.

The **Asian gypsy moth** has still not been found in Maine.

Table 11. Total male gypsy moths *(Lymantria dispar)* collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	0	0	0	0	0	0	0	0	0
Arundel				0	1	0	0	0	*0
Ashland	0	0	0	0	0	0	0	0	0
Bar Harbor							7		0
Blue Hill	0	0	1	4	0	0	0	1	0
Brunswick	220	6	0	0	0	0	0	5	9
Calais	2	5	0	0	0	0	0	0	0
Chesuncook	0	0	0	0	0	0	0	0	0
Clayton Lake									
Dennistown	0	0	0	0	0	0	0	0	0
Elliotsville	0	0	0	0	0	0	0	0	0
Exeter	3	0	0	0	0	1	0	1	1
Greenbush	0	29	0	0	0	0	0	2	0
Guerette	0	0	0	0	0	0	0	0	0
Haynesville	0	0	0	0	0	0	0	0	0
Kingfield	0	0	0	0	0	0	0	0	9
Matagamon	0	0	0						
Millinocket	4	0	1	7	0	2	0	1	3
Mt. Vernon	142	78	1	27	12	0	0	29	0
No. Bridgton	213	17	1	2	0	0	1	3	0
Rangeley	0	0	0	0	0	0	0	0	0
Shin Pond				0	0	0	0	0	0
South Berwick	191	315	153	4	23	1	0	27	9
Ste. Aurelie	0	0	0	0	0	0	0	0	1
Ste. Pamphile							0	0	0
Steuben	1	3	0	0	0	0	0	0	1
Topsfield	2	1	2	0	0	0	0	0	
Washington	13	19	0	0	0	0	1	1	0
Total Number of Moths	**791**	**473**	**159**	**44**	**36**	**4**	**9**	**70**	**33**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Table 12. Total acres defoliated by gypsy moth in Maine by year from 1924 to 1999*

Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated
1924	0.71	1943	10	1962	5,198	1981	655,841
1925	-	1944	21,221	1963	1,970	1982	578,220
1926	1	1945	210,881	1964	<100	1983	26,353
1927	4,985	1946	203,813	1965	<100	1984	4,881
1928	5,575	1947	-	1966	30	1985	10,496
1929	15,187	1948	60	1967	825	1986	13,697
1930	55,174	1949	-	1968	777	1987	849
1931	20,938	1950	2	1969	460	1988	100
1932	42,298	1951	8,195	1970	1,080	1989	34,280
1933	19,718	1952	82,715	1971	820	1990	270,432
1934	60,403	1953	174,999	1972	40	1991	620,933
1935	92,630	1954	170,485	1973	490	1992	278,485
1936	80,944	1955	10,810	1974	860	1993	50,694
1937	140,026	1956	7,285	1975	110	1994	1,706
1938	120,432	1957	120	1976	100	1995	0
1939	202,193	1958	-	1977	2,010	1996	100
1940	204,041	1959	1,000	1978	4,120	1997	<100
1941	122,386	1960	6,350	1979	23,350	1998	0
1942	850	1961	41,245	1980	223,810	1999	0

* Acreage figures used in this table for 1924 to 1960 were taken from USDA/APHIS/PPQ records. From 1960 to 1999 records are from FH&M files.
The presence of a hyphen (-) generally indicates no detectable defoliation for the year.

The gypsy moth quarantine boundary [(Fig. 6) and **Quarantines** (p. 58)] is checked and maintained annually by monitoring for advancing or emerging populations by means of a pheromone trapping survey. This survey is known as the regulatory survey. Survey materials are furnished by USDA-APHIS-PPQ under a cooperative agreement. The survey is conducted with Delta and milk carton style pheromone traps baited with + Disparlure to catch male moths and detect significant expansion of populations in the transition zone, the uninfested area outside of the quarantine boundary. The traps are set out by FH&M entomology technicians and are primarily placed within two to three towns of the quarantine boundary at varying distances apart, usually 1 to 2 miles, along travel routes and at rest areas, campgrounds and similar high use areas. Traps are also placed at and around all mills and yards under gypsy moth compliance agreement. Intensified egg mass searches are conducted around trap sites that yield catches of 10 or more moths.

Figure 6

A total of 245 regulatory pheromone traps were placed in the transition zone and at mill sites with compliance agreements in 1999. Male gypsy moth catches have continued to increase in a number of sites around Eustis, Greenville, Elliotsville and the area around T1R11, TAR10 and TAR11. Scouting surveys for egg masses were conducted in these areas during the late fall and early winter of 1999 by FH&M entomology technicians. One egg mass was found in TAR11 next to the TAR10 town line in December. Egg mass scouting will be continued in the winter of 1999-2000. In 2000, pheromone trapping and egg mass scouting will be intensified throughout these areas of high moth catches in preparation for reassessment of the quarantine boundary.

A resurvey of gypsy moth within the quarantine area is also conducted annually using pheromone traps and egg mass scouting. Surveys to monitor gypsy moth populations in quarantine zone towns within 20 miles of the zone boundary (Fig. 6) were first intensified in 1997 to define the occurrence of gypsy moth life stages in proximity to the zone boundary. Though egg mass surveys were conducted throughout this area in the fall of 1996 and winter of 1997, no egg mass surveys were performed in this portion of the regulated zone in 1998 and 1999. The number of pheromone traps within the quarantine area has also been increased. A total of 89 traps were placed in the quarantine zone in 1999. Male moth catches within the quarantine zone were variable.

Hunter's Moths (several species) - The adults of a number of species of Lepidoptera fly on sunny days and warm nights during the fall and early winter after most insects have gone to rest. Because hunters frequently report their occurrence we have dubbed them **hunter's moths**. In past issues of this summary we have alluded only to the more common Maine pest species found at this time of year. Due to the unusually mild and long fall of 1999 we received more reports than usual of some of the other species so we thought to include these here (Table 13).

Table 13. More common hunter's moths found in Maine in 1999

Common Name	Species	Larval Food	Flight Period
Bicolored Sallow	*Sunira bicolorago*	Many plant species	Sept. 1 - Nov. 30
Bruce Spanworm	*Operophtera bruceata*	Hardwoods	Oct. 1 - Nov. 30
Fall Cankerworm	*Alsophila pometaria*	Hardwoods	Oct. 1 - Nov. 30
Fall-flying Hemlock Looper	*Lambdina fiscellaria*	Softwoods and birch	Aug. 15 - Oct. 30
Linden Looper	*Erannis tiliaria*	Hardwoods	Oct. 1 - Nov. 15
Maple Spanworm	*Ennomos magnaria*	Hardwoods	Sept. 1 - Oct. 30

This list of fall fliers is by no means complete as anyone who ventures forth on a warm fall night can testify but it does include most of the common Maine species whose larvae feed on trees. The flight dates are inclusive for an average year but in a fall such as we had in 1999, the fall cutoff can be much later. Some of the species flying in late November in a normal year could be seen at light up until nearly Christmas in 1999!

Lace Bugs (*Corythucha* spp.) - Lace bug populations again remained at nuisance levels in 1999 especially on birches and butternut. The tiny nymphs, and lacy adults accompanied by an assortment of cast skins and waste material (frass) gave a messy appearance to the undersurface of infested leaves. Heavy feeding caused foliage to become yellow and mottled by July.

Large Aspen Tortrix (*Choristoneura conflictana*) - Defoliation of aspen by the large aspen tortrix was lighter and more spotty in 1999 than in 1998 although much of the feeding activity occurred in the same area. Moth catches in our light trap survey were down as well (Table 14). Less than 100 acres were affected.

Table 14 . Total number of large aspen tortrix (*Choristoneura conflictana)* moths collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	1	0	5	0	0	1	1	0	0
Arundel				0	12	1	4	1	*0
Ashland	0	0	0	0	0	3	0	0	0
Bar Harbor							0		0
Blue Hill	3	14	2	1	5	2	27	0	0
Brunswick	0	3	0	0	0	2	31	0	0
Calais	14	2	0	0	0	0	10	0	0
Chesuncook	0	0	0	0	0	0	0	0	0
Clayton Lake									
Dennistown	0	0	2	0	1	0	0	0	0
Elliotsville	33	42	14	0	2	17	19	2	0
Exeter	5	4	15	6	12	3	18	0	0
Greenbush	25	28	29	0	0	0	3	0	0
Guerette	1	0	0	2	0	0	0	0	0
Haynesville	257	3	0	0	0	0	0	3	0
Kingfield	0	3	0	0	0	0	0	0	0
Matagamon	0	3	0						
Millinocket	14	5	0	0	3	1	0	0	0
Mt. Vernon	4	2	2	0	5	2	8	6	0
No. Bridgton	0	2	0	0	2	0	14	1	0
Rangeley	5	47	92	0	13	14	44	36	0
Shin Pond				1	0	0	0	0	0
South Berwick	3	4	0	0	0	2	31	2	1
Ste. Aurelie	0	0	1	0	0	0	0	2	0
Ste. Pamphile							29	10	0
Steuben	4	2	1	0	0	0	2	1	0
Topsfield	20	15	1	0	0	4	0	3	
Washington	0	14	0	0	2	6	5	1	3
Total Number of Moths	**389**	**193**	**164**	**10**	**57**	**58**	**246**	**68**	**4**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Linden Looper (*Erannis tiliaria*) - The adult moths of this species were common enough in eastern Massachusetts in early November of 1999 to cause a lot of public comment. Although low numbers were seen in southern Maine at this late time of year (see **hunter's moths** p. 30), larval defoliation of hardwoods by this species earlier in the season was not observed.

Locust Leafminer (*Odontota dorsalis*) - Black locust throughout much of southern Maine south of Lincoln and west of Machias continued to exhibit varying degrees of rusty foliage in 1999, the result of leaf mining activities by larvae of this species.

Maple Clearwing Woodborers (Sesiidae) - Low level surveys were conducted for larval boring by the **maple callus borer** (*Synanthedon acerni*) on sugar maple and **red maple borer** (*S. acerrubri*) on red maple in 1999. Stands impacted by 1998 **ice storms** in Turner, Mt. Vernon and Brooks/Waldo were checked and populations appeared light overall. No pheromone traps were used.

Maple Leafcutter (*Paraclemensia acerifoliella*) - Larval feeding discs were visible on sugar maple foliage over a much wider area in 1999 than in 1998. Although spotty moderate defoliation was visible on Mt. Desert Island and spotty light defoliation noted in Kennebec and Franklin counties, defoliation (light and spotty) was more widespread in Cumberland and York counties. Acreage estimates were difficult due to the spotty nature of the problem but probably ran less than 500 acres in total.

Other late season defoliators of sugar maple such as the **maple trumpet skeletonizer** (*Epinotia aceriella*) and **maple webworm** (*Tetralopha asperatella*) were present in all areas checked as well. Defoliation by these species was generally higher than in 1998 but still spotty. Late season pests such as these usually are not a problem unless late refoliation occurs or if there are three or more successive years of high populations.

Maple Leafroller (*Sparganothis acerivorana*) - Populations of maple leafroller remained low again in 1999 and no defoliation of its preferred Maine host, red maple, was observed.

Mountain Ash Sawfly (*Pristiphora geniculata*) - This introduced species is on our list of perennial problems affecting ornamental mountain ash. The 1999 season was no exception with the usual complaints in spite of the fact that control of the problem is easy to achieve. This sawfly is seldom a problem on native mountain ash in the wild.

Oak Insects (various) - Oak is a favorite food source for many insects of both a destructive and curiosity nature. These run the gauntlet from sucking insects (**aphids**, **leafhoppers**, **scales** and **tree hoppers**), which produce the stickum which coats cars, to a variety of foliage and twig **galls** to an equal variety of defoliators. Other than those species singled out in this summary we saw moderate to high populations of the **leafrolling weevil** (*Attelabus bipustulatus*) in 1999. These small shiny black, red-spotted weevils cut and roll leaves into tiny, pellet-like rolls within which the larvae develop. These rolls usually drop to the soil but some, especially incomplete ones, may remain attached to the foliage. The **oak Leaftier (Shredder)** (*Croesia semipurpurana*), **oak leafroller** (*Archips semiferana*), **oak trumpet skeletonizer** (*Epinotia timidella*) and the **oak webworm** (*Archips fervidan*a) continued to turn up in calls as well and were locally abundant throughout southwestern Maine and locally elsewhere in August and September of 1999. Damage was generally light except locally heavier on individual trees. Populations of the **pink striped oakworm**, **redhumped oakworm** and the **variable oakleaf caterpillar** were low in 1999.

Oak Leaf Shot-hole Fly (*Japanagromyza viridula*) - No defoliation by this species was observed in 1999. Fly populations, emergence and bud expansion must be in sync for damage to occur.

Oak Sawflies (various) - Oak sawfly larval feeding increased somewhat in 1999 and foliage skeletonized by these and the **oak skeletonizer** was a fairly common site throughout the range of oak. Larvae of one or more of the following; a small **sawfly** (*Acordulecera* sp.), the **spiny oak sawfly** (*Periclista* spp.) and the **oak slug sawfly** (*Caliroa* ? *fasciata*) were most often involved.

Oak Skeletonizer (*Bucculatrix ainsliella*) - Second generation larval feeding by the oak skeletonizer increased slightly in 1999 from that of 1998 over much of southwestern Maine (Fig. 7). Over 8,000 acres of non-contiguous defoliation was evident by early September (Table 15). Most defoliation fell in the light to moderate category with less than 500 acres of spotty moderate to heavy defoliation. It was the descending larvae which again seemed to prompt the most concern. Larvae were unwelcome guests at many cookouts and other outdoor activities and the tiny, white, ribbed, rice-like cocoons spun up by these larvae added a questionably festive touch as they stuck to all objects beneath infested trees. The cocoons often lay side by side with the larger, tough, coppery cocoons of the **introduced pine sawfly**.

Table 15. Oak skeletonizer defoliation in 1999 by county

County	Acres
Androscoggin	1,000
Cumberland	1,500 +*
Hancock	500 SW
Kennebec	500
Knox	500 +
Lincoln	1,000
Penobscot	500 SW
Sagadahoc	500 +
Waldo	500 +
York	1,500
Total	**8,000** +

*Counties showing unmeasured increases in 1999 over 1998

Oak Twig Pruner (*Anelaphus parallelus*) - For some time we have wondered which species of *Anelaphus* was the more common twig pruner on red oak in Maine. Samples were collected from a number of localities in 1998 and reared. Only *A. parallelus* beetles emerged in 1999. Twig pruning by this species in 1999 remained fairly stable at 1997/98 levels.

Orangehumped Mapleworm (*Symmerista leucitys*) - Populations of this species were low again in 1999 and no defoliation was observed. Numbers of moths of *Symmerista* spp. rose slightly (Table 16).

Table 16. Total number of *Symmerista* spp. moths collected at light

Location	Year								
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	0	0	0	0	0	0	0	0	0
Arundel				4	3	3	3	0	*0
Ashland	0	0	0	0	2	1	0	0	0
Bar Harbor							*0		2
Blue Hill	0	1	6	32	33	7	1	1	0
Brunswick	8	0	1	5	17	3	0	0	1
Calais	1	3	0	0	41	13	3	10	3
Chesuncook	0	0	1	2	20	3	7	2	1
Clayton Lake									
Dennistown	1	0	0	0	0	0	0	0	0
Elliotsville	10	5	4	1	50	2	5	1	3
Exeter	1	0	1	3	15	7	1	0	5
Greenbush	0	0	0	0	10	3	1	0	1
Guerette	0	0	0	0	0	0	0	0	0
Haynesville	0	0	0	0	2	1	0	3	2
Kingfield	0	0	0	0	5	0	0	0	0
Matagamon	0	0	0						
Millinocket	0	0	0	0	4	0	0	1	2
Mt. Vernon	2	4	4	23	141	42	9	22	32
No. Bridgton	10	8	21	12	73	7	10	2	7
Rangeley	1	0	0	0	2	3	0	0	0
Shin Pond				0	26	1	1	0	1
South Berwick	13	30	4	1	5	3	6	13	33
Ste. Aurelie	0	0	0	3	0	0	0	0	0
Ste. Pamphile							*0	0	*0
Steuben	7	0	0	3	13	7	7	2	0
Topsfield	5	3	0	13	152	11	*0	0	
Washington	6	9	10	44	322	12	0	5	28
Total Number of Moths	**65**	**63**	**52**	**146**	**936**	**129**	**54**	**62**	**121**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Oystershell Scale (*Lepidosaphes ulmi*) - Populations increased in 1999 especially on beech in central Maine (central Penobscot and southern Piscataquis counties). Moderate to high populations were observed very locally and some branch mortality occurred. Mortality was probably accentuated by **drought**. Scattered light populations of this scale could be seen statewide on beech and heavier populations were often seen on lilac and other ornamentals.

Pear Thrips (*Taeniothrips inconsequens*) - Populations remained low and spotty on **sugar maple** in 1999.

Pigeon Horntail (*Tremex columba*) - This colorful wood wasp and its very large and striking parasites (***Megarhyssa* spp.**) continue to draw attention. The horntails infest sugar maple and are followed by the large wasp parasites which are drawn to the woodboring larvae. The pigeon horntail continues to be associated with decayed wood on older and/or stressed trees. Reports of activity were more numerous in 1999 than in 1998 and often a dozen or more of the *Megarhyssa* (we have at least 3 species) parasites could be seen assembling, mating and laying eggs on a single tree bole. Changes in populations of this horntail and the associated **sugar maple borer** in response to damage from the 1998 **ice storm** is being monitored.

Pinkstriped Oakworm (*Anisota virginiensis*) - Numbers of this species remained very low in 1999.

Redhumped Oakworm (*Symmerista albifrons* and *S. canicosta*) - Both of these species occur in southern Maine and due to similarities between the two in all stages, our surveys have not separated them. Numbers of larvae remained very low in 1999. The numbers of *Symmerista* spp. moths collected through our light trap surveys (Table 16) however, rose slightly.

Saddled Prominent (*Heterocampa guttivitta*) - No larvae of this species or defoliation was observed in 1999. Moth catches also remained low (Table 17).

Table 17. Total number of saddled prominent (*Heterocampa guttivitta)* moths collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	4	1	3	1	1	0	0	0	0
Arundel				0	0	0	0	7	*0
Ashland	0	0	0	1	0	0	1	1	0
Bar Harbor							*0		5
Blue Hill	2	1	1	2	5	0	0	0	1
Brunswick	34	0	0	0	0	0	0	0	0
Calais	4	3	0	0	0	0	0	6	0
Chesuncook	10	12	13	10	37	18	13	18	8
Clayton Lake									
Dennistown	3	0	0	0	2	0	0	0	0
Elliotsville	5	4	4	0	0	3	0	2	0
Exeter	5	10	0	0	1	1	0	5	2
Greenbush	1	1	1	4	0	0	1	0	0
Guerette	1	0	0	1	0	0	0	0	0
Haynesville	0	0	1	1	1	0	0	0	0
Kingfield	0	1	0	2	0	1	0	0	0
Matagamon	0	1	0						
Millinocket	21	10	5	2	7	12	2	1	0
Mt. Vernon	32	19	1	1	13	6	2	23	18
No. Bridgton	41	15	9	2	0	0	0	0	0
Rangeley	10	4	0	0	1	2	0	0	3
Shin Pond				1	1	0	0	0	0
South Berwick	15	53	3	0	1	0	0	12	4
Ste. Aurelie	0	0	0	0	0	2	0	0	0
Ste. Pamphile							0	0	*0
Steuben	3	17	28	1	3	12	3	4	0
Topsfield	5	11	4	0	7	0	*0	0	
Washington	50	23	1	0	0	0	0	1	4
Total Number of Moths	**246**	**186**	**74**	**29**	**80**	**57**	**22**	**80**	**45**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Satin Moth (*Leucoma salicis*) - Defoliation of woodland aspen by this species increased in 1999 both in area and intensity. The infested area expanded and became more contiguous in previously infested areas in Penobscot and Piscataquis counties from 150 acres in 1998 to 3,767 acres in 1999 (Fig. 8)! Moth catches statewide, however, remained low (Table 18).

Table 18. Total number of satin moth (*Leucoma salicis)* moths collected at light

	Year								
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Allagash	3	2	2	0	0	2	0	0	0
Arundel				0	0	0	2	0	*0
Ashland	0	7	3	5	1	0	0	0	0
Bar Harbor							*0		0
Blue Hill	0	0	0	9	2	0	0	0	0
Brunswick	0	0	2	0	0	0	1	1	0
Calais	5	0	0	3	2	0	2	1	0
Chesuncook	0	0	1	0	0	0	0	2	0
Clayton Lake									
Dennistown	3	1	5	1	0	0	0	0	0
Elliotsville	1	5	2	0	0	0	0	0	0
Exeter	0	0	0	0	0	0	0	0	0
Greenbush	2	0	0	1	1	1	3	0	1
Guerette	3	3	16	7	9	0	1	0	4
Haynesville	0	2	18	5	1	0	0	2	0
Kingfield	0	1	0	0	0	1	0	0	0
Matagamon	0	0	0						
Millinocket	5	17	3	4	0	1	0	1	0
Mt. Vernon	0	0	0	0	0	0	0	0	0
No. Bridgton	0	0	0	0	0	0	0	0	0
Rangeley	4	1	0	0	0	0	0	0	0
Shin Pond				14	0	4	2	3	0
South Berwick	0	1	1	0	0	0	0	0	0
Ste. Aurelie	0	0	0	0	0	0	0	0	0
Ste. Pamphile							0	1	18
Steuben	22	2	2	8	5	0	1	1	0
Topsfield	3	0	3	18	12	1	*0	*0	
Washington	0	0	0	0	0	0	0	0	0
Total Number of Moths	**51**	**42**	**58**	**75**	**33**	**10**	**12**	**12**	**23**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Figure 8

Sugar Maple Borer (*Glycobius speciosus*) - Populations of the sugar maple borer seemed to rise in 1999 along with those of the **pigeon horntail**. The feeling is that this elevated incidence is somewhat coincidental with wounding and stress resulting from the 1998 **ice storms**. **Drought** stress in southern Maine in 1999 may exacerbate the problem.

Tussocks (various) - Tussocks are fuzzy, variably-colored, caterpillars which often show up as defoliators of a variety of trees and shrubs. In most situations defoliation is light and the caterpillars are more of a curiosity. Occasionally, however, populations boom and defoliation becomes noticeable. The hairs of some species can *physically* cause skin irritation unlike those of **browntail moth** (not a tussock) which *chemically* cause a **rash** as well. "**Caterpillar rash**" or "**tussockosis**" is especially a problem during periods of hot weather. The **hickory tussock** (*Lophocampa caryae*), **rusty tussock** (*Orgyia antiqua*), **pale tussock** (*Halysidota tessellaris*), **spotted tussock** (*Lophocampa maculata*) and **whitemarked tussock** and any associated rash were low in 1999.

Uglynest Caterpillar (*Archips cerasivorana*) - The tight webs on roadside and hedgerow cherry containing the yellow, black-headed larvae of this species were more visible in 1999 than in 1998. Pruning out and destroying webs is the simplest method for controlling this nuisance pest. This species is not a looper and should not be confused with the **cherry scallop shell looper** which causes a similar web.

Variable Oakleaf Caterpillar (*Lochmaeus manteo*) - Populations of this insect rose slightly in 1999 but defoliation was spotty and only trace to light in most cases. Numbers of moths from the light trap survey rose slightly in 1999 as well (Table 19).

Table 19. Total number of variable oakleaf caterpillar *(Lochmaeus manteo)* moths collected at light

Location	Year 1991	1992	1993	1994	1995	1996	1997	1998	1999
Allagash	1	1	0	0	0	0	0	0	0
Arundel				0	1	0	0	7	*6
Ashland	10	6	0	1	14	0	0	3	0
Bar Harbor							*3		4
Blue Hill	4	5	0	9	30	9	0	5	15
Brunswick	2	0	0	0	3	0	0	0	2
Calais	4	3	0	0	3	0	0	2	4
Chesuncook	1	0	0	10	62	27	2	2	18
Clayton Lake									
Dennistown	7	0	0	0	5	0	0	0	0
Elliotsville	175	42	5	0	57	3	1	1	15
Exeter	7	0	0	0	6	4	3	0	10
Greenbush	39	3	0	7	11	4	14	17	3
Guerette	1	0	0	3	1	1	2	0	0
Haynesville	86	21	6	39	14	7	4	5	0
Kingfield	158	14	0	7	7	3	4	3	9
Matagamon	13	1	0						
Millinocket	310	122	85	148	185	18	86	23	12
Mt. Vernon	2	0	2	12	1	0	5	13	1
No. Bridgton	6	0	0	3	0	0	1	3	1
Rangeley	3	0	0	0	4	0	0	0	0
Shin Pond				2	15	4	20	5	12
South Berwick	15	3	8	0	4	0	0	6	34
Ste. Aurelie	0	0	2	1	0	0	0	1	0
Ste. Pamphile							*0	*2	0
Steuben	3	0	0	2	3	0	2	0	0
Topsfield	302	250	83	235	50	3	*0	11	
Washington	2	1	0	2	17	2	4	8	26
Total Number of Moths	**1,151**	**472**	**191**	**481**	**493**	**85**	**148**	**115**	**172**
Total Number of Traps	**23**	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**

* Intermittent/incomplete operation

Willow Insects (various) - Willow, especially black and weeping, browned up early in June of 1999 in southern Maine. Much of the damage was caused by the mining **willow flea weevil** (*Rhynchaenus rufipes*) and the **imported willow leaf beetle** (*Plagiodera versicolora*). *Chrysomela* spp. larvae were also involved in some areas.

MISCELLANEOUS Insects and other Arthropods of Medical, Nuisance or Curiosity Significance in 1999

Ants (various) - There never seems to be a shortage of ants and 1999 was no exception. **Carpenter ants** (*Camponotus* spp.) were again a common structural concern but in woodland situations these creatures serve in the important process of wood breakdown. Those pesky little mound forming **lawn ants** (several species) were also common and resisted many homeowner efforts at control.

For those who thought we might have true **fire ants** in Maine - we don't! But we do have a couple of species which are aggressive and pack a potent sting. One of our more widespread stinging species in Maine is one of the **acrobat ants**, *Crematogaster lineolata* which often occurs in rough areas around gardens, in fields or the edge of woods. An introduced (from Europe) species, ***Myrmica rubra***, inhabits coastal areas from Kittery to Eastport. This species is very aggressive and has a powerful sting and unfortunately appears to prefer nurseries and more open areas which have been landscaped and thus often comes in contact with human activities. Highest populations seem to occur at Boothbay Harbor and on Mount Desert Island and some spread has been noted over the past few years.

Another species which may also occur in coastal areas and which may seem to sting is ***Formica integra***. Rather than sting, this species bites and then injects formic acid into the wound producing a burning sensation. *Formica integra* is a close relative of our infamous **Allegheny mound builder ant** *(Formica exsectoides*) which can be a serious problem in plantations and forest regeneration areas where these ants will actually kill small trees to keep an area open to the sun.

Ant flights involving the **cornfield ant** (*Lasius alienus*) were not reported in 1999.

A new ant species, the **ghost ant** (*Tapinoma melanocephalum*) has recently been introduced into Maine. This species was found in greenhouse settings in southwestern Maine in 1999. The species is tropical so is likely to remain a nuisance in heated structures where it seems to prefer wood mulch, decaying wood and some potting mixes. Check as you bring home greenhouse materials.

Banded Woollybear (*Pyrrharctia isabella*) Winter Weather Prediction Survey - Those familiar, fuzzy, red-banded, black caterpillars which children love to play with were not as abundant in 1999 as they were in 1997 and 1998. The period of activity was also diffused and ran from mid September to early November and road crossings were not as pronounced. A series of popular articles on predicting winter weather from the width of the red or middle band (the wider the red band the milder the winter) prompted one reporter in Augusta to gather information for local stories in both 1997 and 1998 and we continued our survey in 1999.
Folklore has it that when the red makes up more than one third of the color, the upcoming winter will be milder. When the black makes up more than two thirds, the winter will be more severe. A one-third red and two-thirds black is considered an indication of a normal winter. The woolly bears predicted a mild winter in 1997 and an even milder winter in 1998 which was actually borne out. To see how accurate the forecast would be this winter we again decided to pit the woolly bears against the various farmers almanacs and the woolly bears have predicted a slightly more colder than normal winter! We'll see!!

Normal = 4.33 red segments on average based on 13 segments per caterpillar

1997/98 = 4.73 red segments on average - mild winter predicted

1998/99 = 5.05 red segments on average - milder winter predicted

1999/00 = 4.3 red segments on average - slightly colder than normal winter predicted

Boxelder Bug (*Boisea trivittata*) - This colorful red and black true bug was found in high numbers again in 1999 in traditionally infested areas of York County, especially Sanford. High numbers were also seen in Augusta (Kennebec County) for the first time in 1999 and low numbers as far north and east as the Bangor area. This species feeds primarily on the developing foliage and seeds of boxelder which is of relatively low importance in Maine and the hosts survive any way. It is the massing and movement of the boxelder bug in the fall that draws the most attention. In this process numbers can be enormous and it was possible in Augusta and Sanford to scoop up literally buckets full of nymphs and adults from around the base of infested trees and foundations in the fall of 1999. This species hibernates in litter and in buildings and may easily be confused with the **small milkweed bug** (*Lygaeus kalmii*) adults of which have a similar appearance and habit of entering homes to hibernate.

Butterflies (various) - Anyone traveling through wooded areas of central, northern and western Maine in early June of 1999 couldn't help but notice the large colorful aggregations of butterflies especially at wet seeps in and along the roadways. First came the **Canadian tiger swallowtail** (*Papilio canadensis*) followed by the **white admiral** (*Limenitis arthemis*) and the **viceroy** (*Limenitis archippus*). In spite of the large numbers of butterflies, it was difficult to find the more solitary larvae later in the season and no defoliation was observed.

Cockroaches (various) - Every year we encounter a variety of cockroach calls and find forest roaches and wood roaches in our light trap surveys. Low numbers of domestic cockroach situations were investigated in 1999. One in particular might be of interest to our readers, that of an infestation of potted greenery by the relatively large **Surinam cockroach** (*Pycnoscelus surinamensis*). This species is not generally considered a household pest or filth roach and generally restricts its activities to the potted foliage plants. It is extremely sensitive to cold and will not survive out of doors in Maine. Nymphs are very dark and somewhat resemble small **oriental roaches**. Adults are quite distinctive. Just a reminder that Maine does have several species of cockroaches which live outside year round. These are not generally considered filth roaches although they can sometimes be confused with domestic species. The larger **brown wood roaches** (*Parcoblatta* spp.) live entirely outside of buildings in and around decaying wood and wood rich soil. The smaller straw colored **forest roaches**, *Ectobius* spp., consist of three or four introduced species. All occur in coastal areas or at most a few towns inland and are attracted to light at some times of the year. Species in this group somewhat resemble the **German cockroach** but forest roaches (*Ectobius* spp.) are generally paler and prefer to stay outside of buildings, fortunately!

Dogwood Sawflies (*Macremphytus* spp.) - Dogwood, especially gray and red osier, are often stripped of their foliage seemingly "overnight" by the larvae of one or more of these sawflies, and populations were again high locally in 1999. The larvae are basically yellow with black spots or oval markings at maturity but as they feed in the early stages they are covered with a white, woolly wax. Mature larvae wander in search of a place to pupate and may bore into relatively soft wood (siding, decking, etc.) as much as one inch! It is this habit that frequently draws the quickest attention and when asked about defoliation in the area the landowners frequently did not notice stripped shrubs nearby!

Euonymus Caterpillar (*Yponomeuta cagnagella*) - Reports of defoliation were scarce in 1999.

Fall Insects - As most homeowners prepared for the coming winter on warm fall days, many insects were doing the same. Some of the common ones which we encountered in 1999 were **ants**, **banded woollybears**, **bumble bees**, **boxelder bugs** (p. 39), **cluster flies**, **hunter's moths** (p. 30), **multicolored Asian lady beetle** (p. 42), **paper wasps**, **western conifer seed bugs** (p. 22), **woolly alder aphids** and **yellow jackets**.

Garden (or Snailcase) Bagworm (*Apterona helix*) - Our only infestation of this small introduced European bagworm continues to be in Sanford. As the females are wingless, the only means of spread is by movement of infested items. Watch for this one and report any suspected sightings. For more information see Summary Report #13 p. 36.

Japanese Beetle (*Popillia japonica*) - Populations were present, active and spotty in 1999 but changed little overall from 1998. Some areas exhibiting high populations in 1998 showed reductions while other areas showed increases. Defoliation of littleleaf linden in Augusta was not as pronounced in 1999 as in 1998 but defoliation of linden along Route 2 in Farmington and at several locations in Sanford was very noticeable.

Populations of the often associated, tawny, spidery-looking, red-legged, sexually active **rose chafer** (*Macrodactylus subspinosus*) beetles emerged early during the first week of June and by mid June had already denuded host plants in ornamental settings and several cemeteries in Kennebec County. These were the highest, most concentrated and destructive populations seen in years. No new areas of infestation by the **oriental beetle** (*Anomala orientalis*) were reported in 1999. Gorham remains our only reported infestation.

Lily Leaf Beetle (*Liliocerus lilii*) - The activities of this introduced leaf beetle are still limited to a variety of locations in Cumberland (Bridgton and Portland) and York (Ogunquit, Wells and York) counties. The adults are striking red beetles with a black head and legs and the larvae are slimy and ugly. Damage to lilies can be severe.

Medical Entomology - Maine state government does not have a designated medical entomologist position. As a result, our FH&M staff receive requests for advice and assistance in dealing with an array of insect and other arthropod related problems. Included in these requests are questions relating directly to such things as **bedbugs**, **bird mites**, **black flies**, **bot flies**, **deer flies**, **fleas**, **horse flies**, **lice**, **mosquitoes**, **no-see-ums**, **spiders**, **stinging insects** and **ticks**. Also included are insect/arthropod vector related disease problems such as **eastern equine encephalitis**, **heartworm** and **lyme disease** and a series of **allergies**, **rashes** and **reactions**. The actual numbers of requests are not high except for those associated with ticks and lyme disease but individual concern is often great. Disease questions *per se* are referred to medical professionals. In addition to these problems, the outbreak of the mosquito transmitted **West Nile Virus** in the New York city area in 1999 prompted concerns and many questions in Maine as well. The **vector borne disease group/lyme disease working group** with which we are associated, is keeping abreast of the situation and fielding questions.

Biting Flies (black flies, **deer flies**, **mosquitoes and no-see-ums) -** Comments about biting fly activity in 1999 ranged from "wow-no bugs" to "I can't stand it" but overall we found biting fly activity to be very low this season compared to usual. There were hot spots especially with locally high numbers of **no-see-ums** in wetter areas of northern and western Maine. **Salt marsh mosquitoes** continued to be a problem in coastal areas and **deer fly/horse fly** populations were up and early in some areas as well. The highest populations of upland mosquitoes occurred in the vicinity of swamp land and the infamous **Penobscot River black fly** populations picked up through September as usual. The infamous **salt marsh greenhead fly** (*Tabanus nigrovittatus*) and its cohorts again plagued bathers along the coast south and west of Penobscot Bay from mid July through mid August.

Rashes related to insects were again of concern in 1999 in response to activities of the **browntail moth** (p. 25) in the Casco Bay area (Cumberland County) and but less so to populations of **tussocks** (p. 36) elsewhere.

Spiders - Questions and concerns over spiders were more common in 1999 than in 1998 (Table 24). These fell primarily into two categories; are they poisonous (?) and how do I get them off the siding of my house? A rise in the frequency of spider bites in the home prompted concerns as to which species were involved and how serious they were. Although no serious bites were reported, a number of **sac spiders** (Clubionidae) were sent in for identification thinking that they might be the somewhat poisonous *Cheiracanthium* spp. Most were less problematic related species of *Clubiona*. Individuals are cautioned, however, to avoid confrontation with spiders especially those associated with imported fruits and vegetables. Suspect spiders should be placed in 70% alcohol and sent in for identification especially if a bite is involved and even if the spiders are squashed. Use care in handling to avoid getting bitten.

As far as the **siding spiders** go, 1999 was one of the worst seasons in many years. White siding near outside lighting was often fouled by numerous dark spots of webbing and feeding debris of a number of species of both juvenile and adult spiders. Several buildings in Augusta were so heavily infested that they appeared yellow when viewed from a distance. Hosing off the siding sometimes helped but scrubbing was often necessary.

Stinging insect populations in Maine seemed similar in 1999 to those of 1997 and 1998 at least in southern Maine. Numbers of **bald-faced hornets**, **bumble bees**, **honey bees** and **yellow jackets** picked up slightly but were still low. Some **ground nesting solitary bees** and **paper wasps** (*Polistes* spp.) seemed to fare better. The **paper wasps** were probably the number one problem species as far as stinging species go as they occur in greatest numbers around buildings especially as they seek hibernation sites in the fall. Colonies of those interesting greenish, fuzzy, **ground nesting bees** (*Agapostemon* sp.) were again reported from southern Maine in 1999. The large beneficial **great golden digger wasp** (*Sphex ichneumoneus*) was even more common and active in 1999 than in 1998 from central Maine south. While fruit and vegetable growers remain concerned about a noticeable reduction in pollinators, campers and picnickers welcomed the relatively low numbers of yellow jackets.

Ticks (Ixodidae) - The number of requests for tick identification received at the Insect and Disease Lab rose slightly from 390 in 1998 to 396 in 1999. This is the highest number of requests processed to date in any one year and reflected the higher than usual numbers of adult **lyme** or **deer ticks** (*Ixodes scapularis*) submitted from October through December. Roughly 60% (234) of the requests involved *I. scapularis*, 158 (68%) of which were submitted after September 15th. It appears from submitted ticks that the lyme tick populations are extending rapidly eastward and inland. Our data will again be pooled with that of the Maine Medical Center Lyme Disease Research Laboratory for use by the lyme disease working group.

Seven additional species of ticks were identified from submitted specimens for a total of 8 of Maine's 13 species of Ixodidae. The highest numbers and greatest diversity occur in southern Maine (Fig. 9). The two most common ticks other than the lyme tick were the **woodchuck tick** (*Ixodes cookei*) and the **American dog tick** (*Dermacentor variabilis*). Of these the American dog tick was by far the most abundant in the field in 1999 but our clients appear to be more sure of the identification of this species and tend to report it to us less frequently. Populations of this species continued to spread slowly north and east as well. Larvae of the **moose** or **winter tick** (*Dermacentor albipictus*) were again common in November and December as far north as Fort Kent.

Lyme disease in Maine - The incidence and risk of acquiring lyme disease in Maine is still relatively low overall although the situation continues to change as populations of the tick vector expand eastward and northward. The area of greatest risk continues to fall along the coast west of the Schoodic Peninsula (Fig. 9). Lyme disease is a complex issue in Maine made even more complex due to the limited nature of the problem here and by expanding media coverage nationally. In 1986 a lyme disease working group was established to follow the progression of the then relatively new and local problem within the state and to try

and set levels of risk based on vector populations. As results became available they were provided through a variety of publicity channels. Although we now have a fairly good handle on the problem there are still questions associated with individual interpretation of the significance of what is known of disease ecology, dramatic variability in the distribution of infected deer ticks, human mobility, testing protocols and simple problems of clinical diagnosis and reportability. Unfortunately we are now left to further address the vaccine issue including appropriate use following its approval late in 1998. A set of guidelines on the vaccine was prepared to aid in the process of evaluation. Further discussions on the vaccine and on lyme testing protocols are sure to continue in 2000 and beyond. Further information on lyme disease can be seen through the Me. Med. Ctr. website at <http://zappa.mmcri.mmc.org>

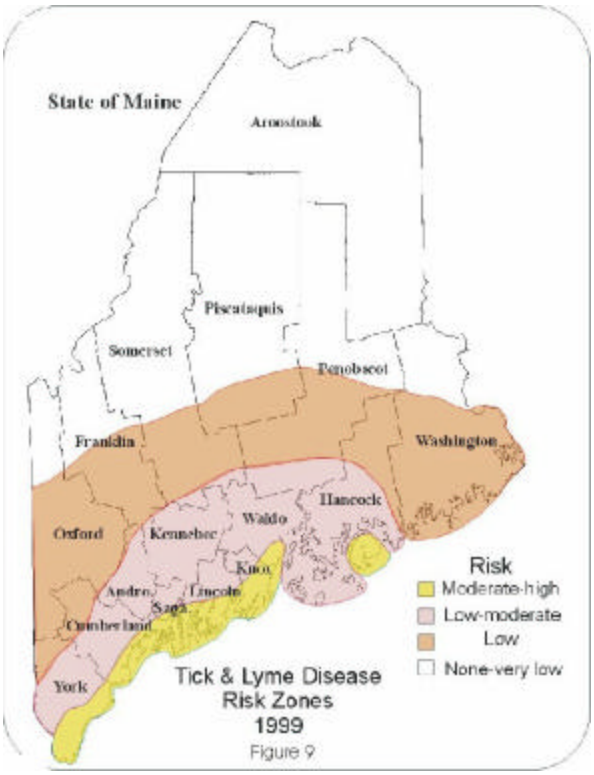


Figure 9

From 1986 through 1999, a total of 404 Maine residents have been diagnosed with lyme disease with 257 (64%) of these cases believed to have been Maine acquired. There were 74 cases reported in 1999 alone of which 54 (23%) were Maine acquired. Although the three-shot vaccine has been in use for over a year now, no statistics are available on the extent of its use.

Multicolored Asian Lady Beetle (*Harmonia axyridis*) - The fall arrival of these pestiferous little lady beetles was much less striking and diffuse in 1999 than it has been since they first arrived in numbers in 1994. Although they started to appear in early October a cold snap soon seemed to cut off the flow of this species as well as other fall visitors to buildings; **cluster flies** (*Pollenia rudis*), **paper wasps** (*Polistes fuscatus*) and the **western conifer seed bug** (p. 22). Milder weather later in the month and in November seemed to stimulate renewed activity, albeit much less.

Powder Post Beetles - Powder post beetles remain an ongoing structural problem in Maine as they attempt to reduce building timbers to organic soil. We annually deal with a few stubborn infestations made more complex due to the unheated nature of some vacation homes and the use of firewood. ***Ptilinus ruficornis*** and ***Hadrobregmus carinatus*** seem to be our most common species. Control is difficult due to the lack of effective registered pesticides.

Public Assistance - The FH&M Division provides technical assistance to a broad range of clientele. Members of the FH&M staff also give talks and are involved in presentations, workshops, conferences, and other similar training activities to inform and educate the public about trees and tree pests.

The FH&M office, laboratory and field staff handled 3,282 requests for assistance in 1999 which are summarized in Tables 20 through 24. As indicated in table 20 the total number of requests decreased 455 in 1999 from 1998 and 426 (94%) of this reduction was in tree and quarantine related categories. This may in part be due to greater outreach and education and with our FH&M website. Also, a change in the gypsy moth quarantine policy which now allows the use of gypsy moth compliance agreements in New Brunswick has resulted in a reduction in requests for state gypsy moth permits from mills in that Canadian province.

Specific information about forest and shade tree problems encountered during the year can be found elsewhere in this Summary Report.

Table 20. Total number of requests for advice and assistance, 1997, 1998 and 1999

PROBLEM	TOTAL REQUESTS		
	1997	1998	1999
Forest, Shade and Ornamental Tree	2,018	2,168	1,816
Forestry Related Quarantines	2,019	425	351
Human Health Related Pests	486	914	879
Household, Nuisance and Miscellaneous	288	230	236
TOTAL	3,358	3,737	3,282

Table 21. Number of requests received in 1999 for advice and assistance about forestry related quarantines

PROBLEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ELC requests	1		3			1							5
Gypsy moth permits	17	24	36	4	16	35	33	13	40	21	19	13	271
HWA requests	2	1	1			2	1	1	19	3	2		32
Compliance agreements				1		2							3
Gypsy moth requests	1	2	2		1	1	1	3					11
Ribes				2									2
Pine shoot beetle								3	5	5		5	18
Other requests		2		2				1	2			2	9
TOTAL	**21**	**29**	**42**	**9**	**17**	**41**	**35**	**21**	**66**	**29**	**21**	**20**	**351**

Table 22. Number of requests received in 1999 for advice and assistance about pests affecting human health

PROBLEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Browntail moth	27	19	30	72	99	67	28	6	1	2	2	3	356
Ticks	4	3	8	46	75	85	43	17	10	69	87	28	475
Mosquitoes				1	2	1							4
Human health pests				4	3	7	8	5	7		3	3	40
Biting flies					1	2					1		4
Blackflies													0
TOTAL	**31**	**22**	**38**	**123**	**180**	**162**	**79**	**28**	**18**	**71**	**93**	**34**	**879**

Table 23. Number of requests received in 1999 for advice and assistance about forest, shade tree, and ornamental pests

PROBLEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Abiotic factors	2		1	3	8	11		6	2	2	2	3	40
Animal damage					1		1	1	1				4
Anthracnose						1			1				2
Arborvitae leafminers	1			1	3	5							10
Asian longhorned beetle	3	7	1	2	5	12	3		3	1	1	1	39
Adelgid galls on spruce					2	1							3
Annosus root rot													0
Aphids							3	4				1	8
Apple scab disease													0
Ash decline	4				1	1			2		2	1	11
Ash leaf & twig rust			1			2							3
Balsam needle gall midge	1		1	4	8	12	1	2	3	3	8	10	53
Balsam shoot boring sawfly				1				1					2
Balsam twig aphid	1		3	5	11	15	1	3	3		2	1	45
Balsam woolly aphid							1	1		6	1		9
Bark beetles			1				9	9	6	1		1	27
Beech bark disease			1		1					1			3
Birch casebearer													0
Birch leafminers										1			1
Black knot of cherry			1	1									2
Bronze birch borer													0
Brown ash decline													0
Bruce spanworm													0
Butternut canker													0
Cankers					1	3		1		2			7
Canker worms													0
Chestnut blight fungus							1	2				1	4
Dogwood anthracnose													0
Drought	1		4		1		1	2	1				10
Dutch elm disease	1		2				1						4
Eastern dwarf mistletoe	2		2	2	3	2	3	2	2		3	1	22
Eastern tent caterpillar													0
Elm leafminers													0
European larch canker									1	3			4
Fall webworm							3	26	17				46
Fir-fern rust						2	1						3
Fir-fireweed rust													0
Fire blight						2							2
Forest practices			2										2
Forest tent									1				1
FIA	1			11	52	56		3	5	84	52	19	283
FHM	4	7	1	9	10	11	4	11	7	8	2	5	79
Galls on deciduous trees				1			1		1				3
Gypsy moth	3					9		2		1	1		16
Hardwood decline						5	2	2	5	4	4		22
Hemlock borer	7		3		3	3	4	4	1		2	1	28
Hemlocklooper		1						1	2	4	3	2	13
Hemlockwoolyadelgid									5	1	1		7
Herbicide									2				2
Horse-chestnut leaf blotch													0
Hunters Moths													0
Ice storm damage	26	9	16	19	8	12	7	11	9	3	3	3	126
Introduced pine sawfly	1			1		1	2						5
Japanese beetles							9	3	1	1		1	15
Jap. long horned beetle													0
Eastern larch beetle			2	3	2	4							11
Larch casebearer													0
Leaf beetles				3		6	1				4	2	16
Maple decline		1					1	2					4
Maple trumpet skeletonizer													0
Mites				2			1						3
Mountain ash sawfly							1						1
NAMP	1						1						2
Needle cast disease				1						1		1	3
Oak leafroller													0
Oak skeletonizer	1		1				3	2					7
Oak twig pruner													0
Pear thrips				1									1
Pine needle rust							1						1
Pine shoot beetle	3	2									1		6
Poison ivy						1							1
Psocids							10	16					26
Root rot					4				1	1			6
Root weevils													0
Rose chafer				1		10							11
Roundheaded appletree bor.													0
Rusts													0
Sapsucker injury													0
Salt injury													0
Satin moth													0
Sawflies						6	7						13
Sawyer beetles					2	1	1	1		1			6
Scale insects						3	1					2	6
Shoot boring sawfly				4									4
SNB				1	1	1							3
Spittlebugs													0
Spruce beetle	2	3	2	6	4	4	4	2	6	3	4	2	42
Spruce budworm	1	2	4	8	8	12	2	4	5	3	3	4	56
Spruce gall adelgids	1						3	7		2	1	2	16
Spruce health			1	1	2	2	4	2	1	2	3	1	19
Spruce needleminer													0
Tar spot on maple								1					1
Variable oakleaf caterpillar								2					2
White pine blister rust	2			2	6	1		1	1				13
White pine weevil	2	1	1	3	3	6	2	5		1			24
Woodborers			2	1	1	2	2	2	2	4		1	17
Yellowheaded spruce sawfly				2	4	21	7	3	4		2		43
Other requests	20	34	23	42	29	62	46	65	46	41	42	36	486
TOTAL	**91**	**67**	**76**	**141**	**184**	**308**	**156**	**212**	**147**	**185**	**147**	**102**	1,816

Table 24. Number of requests received in 1999 for advice and assistance about household, public nuisance, and miscellaneous pests

PROBLEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Ants					1	1	1						3
Asian lady beetle	2	3	15	5	2			1	1	1		1	31
Bees				1	1	1							3
Bird mites						1	3						4
Booklice													0
Carpenter ants	2	1	1	2	5	3	6	1	1	1			23
Clothes moths													0
Cluster flies		2	2					1					5
Cockroaches				1									1
Crickets													0
Dermestid beetles	1							1	1			1	4
Earwigs							3						3
Firewood insects			1										1
Fleas													0
Flies		1					2	1	2	2			8
Fruit flies											1		1
Fungus gnats				1									1
Hornets and wasps				1	5	1	5	4	4			2	22
House flies													0
Indian meal moth	1			1	1								3
Ladybird beetles													0
Mealworms													0
Midges													0
Misc. insects*				1	3	4	3	3	1				15
Misc. non-insects**	1	1	1	1	3	1	2	2	3			1	16
Pantry pests				1	1		6	1	2		1	2	14
Powder post beetles				1	1		1	1	1	2		1	8
Spiders	3			2	8	9	3	7	4	2		1	39
Springtails	2												2
Western conifer seed bug	2	8	7	7	1					4			
TOTAL	**14**	**16**	**27**	**25**	**32**	**21**	**35**	**23**	**20**	**12**	**2**	**9**	**236**

* include such things as silverfish and non powderposting woodborers ** include such things as house centipedes, millipedes and pseudoscorpions

Termites - This is just a reminder that we do in fact have termites in Maine. Although a variety of species have been introduced at times, most did not find our climate suitable for establishment. The **eastern subterranean termite** (*Reticulitermes flavipes*), however, has found some suitable sites here and has become locally established. We now have records from:

Cumberland County - spotty but established in a number of towns
Kennebec County - Augusta only
Oxford County - Bethel only
York County - spotty but established in a number of towns

Spread from existing infestations has been slow and limited even in Cumberland and York counties. The Kennebec and Oxford county infestations have changed little over the past ten years. With the current moderation of climates, however, this may change.

Viburnum Leaf Beetle (*Pyrrhalta viburni*) - Larval feeding just about decimated many viburnum hedges throughout southwestern Maine again in 1999 in the area south of U.S. Rte. 2 from Rumford to Old Town and from Hancock County west. At least low numbers of these beetles have been found east to Machias and north to Millinocket. Damaging populations have also been found on native viburnums in openings in wooded areas several miles from planted stock.

Mortality of heavily infested shrubs is fairly common.

DISEASES and INJURIES Associated With Trees in 1999

Acid Rain (caused by certain pollutants entering the atmosphere and reacting to form sulfuric and nitric acids) - This subject has received much play in the popular media over the years but most reports of damage are unfounded or attributable to other causes. But the perception persists that acid rain is significantly destructive to forest vegetation. Each year we receive calls expressing concern about the effect of acid rain on Maine forests.

Most recent research has concluded there is no evidence of general, widespread decline of forest species due to acidic deposition, though there may be local effects due to acid fog at certain coastal or high elevation sites in the northeast. There may also be subtle effects of acid deposition such as increased nutrient leaching from plants and soils which may negatively impact tree growth or winter hardiness. And there is the possibility that effects of acidic precipitation may increase the susceptibility of trees and other plants to certain diseases. Studies are ongoing to elucidate these possible effects.

When acid rain first commanded national attention in the 1970's and 80's, it was common for weather forecasters to announce the acidity of precipitation events as part of local weather broadcasts. This practice has now largely ceased, but we recently asked our state Department of Environmental Protection about trends in acid precipitation in recent years. We were interested to note there were no trends. The mean pH of precipitation statewide has held steady at about 4.6 since 1982.

Anthracnose of Ash, Birch, Catalpa, Maple, and Oak (caused by *Apiognomonia errabunda, Marssonina betulae, Glomerella cingulata, Kabatiella apocrypta,* and *Discula quercina* respectively) - These diseases, which cause irregular tan or brown spots or blotches on leaves often followed by defoliation, were quite variable in 1999. We received reports of birch and maple anthracnose, but few reports of ash, catalpa and oak anthracnose. The spring of 1999 was relatively dry, but abundant rainfall at critical times during leaf expansion in May provided the opportunity for moderate foliage infection on some sites.

Ash Leaf and Twig Rust (caused by *Puccinia sparganiodes*) - This disease was last epiphytotic in Maine from 1982-1984. The moderate outbreak of this disease which began in 1995 in the Stockton Springs/Frankfort/Winterport areas of midcoast Maine diminished in 1998 to endemic levels, and remained endemic in 1999.

Ash leaf and twig rust is a spectacular disease when it occurs in epiphytotic situations, often totally defoliating trees. It only occasionally kills trees, but may weaken them so that they succumb to other causes, especially where the disease strikes heavily in successive years.

The trend for this disease is static at low levels.

Ash Yellows (caused by a mycoplasmalike organism) - Ash yellows apparently does not occur in Maine. Recent surveys for this disease conducted by the University of Maine have proved negative. It is interesting to note, however, that this same phytoplasma is also capable of infecting common lilac *Syringa vulgaris* (Walla, J.A. and Y.H. Guo. 1998. Lilac Witches'-Broom in North Dakota. Plant Dis. 82:1404).

Atropellis Canker (caused by *Atropellis tingens*) - Atropellis canker is a relatively uncommon fungal disease of pines in Maine which is occasionally a problem in Scotch pine plantations and natural stands of pitch pine, particularly in the southwestern part of the state. This disease is characterized by sunken, perennial cankers on twigs, stems and branches. Wood beneath cankers is darkly stained bluish black in color. The bluish black stain often appears wedge-shaped when branches are cut and cankers are viewed in cross-section. Affected branches flag and needles turn brown in spring and early summer.

We received one new report of this disease in 1999, in a Scotch pine plantation in Auburn. The disease is potentially damaging to pines in Christmas tree plantations but usually is not much of a problem in Maine where relatively few pine species are now grown for Christmas trees. Where pines are planted, *Atropellis*-free planting stock is generally used and plantations are rarely established near infected natural stands, so chances for infection are low.

Balsam Fir Needlecasts (caused by *Isthmiella* and *Lirula* spp.) - These needlecast diseases were widespread and common on balsam fir Christmas trees again in 1999. We received specimens last spring from Christmas tree plantations from China to Mars Hill, with many locations between. The causal organisms are generally common among stands of wild trees, but only occasionally a problem among cultivated trees.

Symptoms are generally confined to foliage two years old or older; current season growth, even when infected, remains green until the second growing season. But it is the infected third year growth upon which infective spores are generated and which in turn serve to cause infection of current season growth during the summer. Commonly a continuous dark line is noticeable on the undersides of infected third year needles, especially if *Lirula nervata* is the causal organism. Often trees infected by *Lirula* and *Isthmiella* needlecast fungi are attacked by other needlecast fungi as well, including species of *Rhizosphaera* and *Lophodermium*, which develop under the same sort of cool, moist conditions which favor the former pathogens.

No chemical control products are presently registered to help manage *Lirula* and *Isthmiella* infection in Christmas tree stands. Cultural control suggestions revolve around practices to open stands to light and promote good air circulation, low branch pruning, and confining shearing to dry weather only.

An excellent booklet How to Manage Needlecast Diseases on Balsam Fir prepared by the United States Forest Service is available as single copies from this office. Supplies are extremely limited.

Beech Bark Disease [caused by beech scale (*Cryptococcus fagisuga*) and *Nectria coccinea* var. *faginata*] - This disease, which was introduced to Maine in the early 1930's, continues to kill or reduce the quality of beech stems statewide. But beech bark disease does not threaten to eliminate beech from the Maine forest because some trees are resistant, and even susceptible trees sprout profusely from roots when trees are damaged, killed or harvested.

Infected trees exhibit rough patches of dead bark which may contain small, reddish fruiting bodies of the causal fungus. Scattered through most stands are a few smooth barked, resistant trees. Landowners managing for beech may wish to leave these resistant stems during thinning or selective harvesting operations, while poisoning cut stumps of susceptible trees to prevent root sprouting.

Losses attributable to beech bark disease are extensive but assessment of the damage is complicated by the effects of drought, oystershell scale, late spring frosts, and various hardwood defoliators.

Black Knot of Cherry (caused by *Apiosporina morbosa*) - This disease is common in forest situations throughout the state on wild cherry trees and is particularly conspicuous on black cherry where galls a foot or more in diameter may occur. Where these galls occur on the main stem the value of cherry for lumber is considerably reduced. Damage often extends internally well beyond the galled area, because the gall canker serves as an entry point for wood decay organisms which spread internally over time.

Frequently we receive reports of black knot infections on cultivated peach, cherry or plum trees in landscape or home orchard situations. All too often by the time we are consulted the disease has progressed to such an extent that the usual control practice of pruning knotted twigs and branches to remove infected tissue would essentially reduce the tree to a stump. It is important to diagnose this disease early, prune any knotted twigs each year before April 1, and spray if necessary with the fungicide thiophanate methyl in order to maintain healthy, productive fruit trees.

Brown Ash Decline (caused by environmental stresses) - The recovery of black ash, *Fraxinus nigra*, (called brown ash in Maine) from a state of serious decline, continued in 1999. The statewide decline first became apparent in Maine in 1992 and was studied and evaluated on 57 plots established in four geographical zones throughout Maine in 1993 (MFS Tech. report #33). In 1995, remeasurement of 31 of the original plots showed that apparently the decline had subsided and brown ash condition was improving (Tech. report #37). Meanwhile, studies at the University of Maine had shown significant correlations between reduced brown ash growth and high water and freezing events in the early winter followed by spring drought conditions. Studies by the MFS and USFS - FHP in the 90's had not shown any significant relationships between insect or disease agents and the decline.

Insect and Disease Management staff did not remeasure plot subsets in 1999, but plan to do so in 2000.

It is possible that the summer drought of 1999 may affect recovery of this species, so next year's remeasurement will also include evaluation of any drought stress which may be apparent.

Bud Abortion of Balsam and Fraser Fir (caused by low ambient air temperatures prior to bud break) - This problem seems to be increasing in recent years, but is nothing like the damage Maine experienced in the late 80's where many trees were rendered unsaleable. Bud abortion in 1999 was generally limited to occasional buds at the tips of side branches of Christmas trees, and more commonly to terminal and lateral buds of leaders. Often only one or two of the buds of a terminal bud cluster would break into growth. Another common symptom was that the center bud of the terminal bud cluster would abort, but the rest of the buds would break normally, often resulting in a multiple topped tree.

Susceptibility to bud abortion seems to vary with seed source. On one central Maine farm, the progeny of trees grown from seed collected wild in Aroostook County aborted heavily, while progeny of trees collected wild in Nova Scotia exhibited much less bud abortion. And progeny from one selected tree from an unknown provenance exhibited only one aborted bud among thousands of half-sib progeny.

Butternut Canker (caused by *Sirococcus clavigignenti-juglandacearum*) - Butternut canker, a disease which has virtually eliminated butternut in the Carolinas, was first found in Maine in 1993 when we located the disease in Kennebec County. We continued to survey for this disease in succeeding years, and have now located it in all Maine counties except Washington County (Fig. 10).

Figure 10

Butternut canker is characterized by dying branches and dead tops, development of epicormic branches, discolored bark which may ooze a thin black inky fluid in the spring, and cankers on the main stem, buttress roots, and branches. When bark in cankered areas is physically stripped away, the sapwood beneath exhibits dark brown, spindle-shaped, stained areas.

No effective controls are available to halt the spread of this disease at this time. Logging injuries should be minimized when harvesting. In nurseries, and perhaps in some homeowner situations, application of fungicides may be appropriate. In some states, butternut harvesting guidelines and even harvesting moratoriums are now in effect. There is considerable evidence that resistant individual butternut trees exist within the native population and researchers are now beginning to develop strategies to exploit that resistance to protect the species.

Butternut canker was recently found at several locations in New Brunswick, Canada, all within about 20 km of the State of Maine.

The upward trend of this disease is expected to continue into the foreseeable future.

Caliciopsis Canker (caused by *Caliciopsis pinea*) - This is a generally minor, but occasionally important disease of eastern white pine which is often overlooked. Though we have known about this disease for many years, we are only now becoming aware of its significance and widespread occurrence in Maine. Every year we receive a few inquiries about cankered trees in stagnated white pine stands, and frequently we diagnose Caliciopsis canker as the cause.

Cankers may occur anywhere on tree trunks or suppressed branches and usually occur only in small numbers on a single tree. However, severely attacked trees may contain as many as several hundred cankers. Cankers may be superficial or they may extend into the cambium, killing it.

This is primarily a disease of stagnated stands or suppressed trees in dense stands. It may be effectively managed through judicious and timely stand thinnings.

Chemical Injury (phytotoxicity due to chemical pesticide application) - We received many reports of chemical injury to trees and shrubs in 1999. Growers and landscape managers should be especially alert to the possible phytotoxic effects of certain pesticides when applied to tender, emerging plant foliage. Certain evergreens are quite susceptible, especially when applications involve emulsifiable concentrates, mist blower applications, and/or treatment during hot weather. We have repeatedly warned balsam fir Christmas tree growers to be careful of Diazinon AG 500 and Lorsban 4 E when applying them during late May and early June.

Causes of chemical pesticide injury are many and varied. Among the calls we investigated in 1999 was herbicide injury involving application of Roundup Ultra over the tops of small balsam fir Christmas trees. Although the label cautions against allowing Roundup Ultra to contact the foliage of Christmas trees, many growers apparently fail to pay heed to the warning. Some of the older formulations of Roundup were more forgiving, but not Roundup Ultra. Read the label!

Chestnut Blight (caused by *Cryphonectria parasitica*) - This disease, which was introduced to North America around 1900 on nursery stock of oriental chestnuts, subsequently spread into Maine and quickly destroyed our native American chestnut resource. A few infected trees persist, often sprouting from old stumps, and occasionally a seedling will grow to considerable size in the woods before succumbing to the disease. American chestnut trees planted as landscape specimens also frequently attain considerable size before fatal infections develop. None of these native trees is truly resistant to the disease.

Recently considerable interest has been expressed in support of an effort to reintroduce the American chestnut into Maine forests. The Maine Chapter of the American Chestnut Foundation is proceeding to breed resistant strains of American chestnut using native Maine chestnut sources. These trees are being crossed with partially resistant strains which are under development by the American Chestnut Foundation in Virginia. Within twenty years or so it is hoped that blight resistant trees with native Maine genes will be ready to reintroduce the species to Maine forests.

Cones on Balsam and Fraser Fir Trees - After a big cone year in 1998, fir trees seemed to take a year off in 1999. Christmas tree growers generally were spared the tedious task of removing unwanted cones from fir of both species, and the Maine Christmas Tree Association collected no seed from either of its seed orchards.

A moderate number of cone buds are now set for 2000 on balsam fir, and perhaps fraser as well, but cones should be less abundant next year than they were in the summer of 1998.

Cristulariella Leaf Spot (caused by *Cristulariella* spp.) - This disease, which caused extensive leaf spotting and defoliation especially of boxelder in south central Maine in 1990, has since all but disappeared. Apparently the weather conditions which favor this disease, consecutive hot, summer days and nights with high dew points, have not recurred in Maine since that time.

Drought - The 1999 season again showed some of the climatic excesses of 1995. The growing season began roughly two weeks earlier than normal followed by a hot dry period for much of the state in June, July and August. As a result, the foliage of beech, birch and some other vegetation on droughty sites showed some wilting in July and premature yellowing and leaf drop by August. Weather patterns turned around and conditions throughout much of the state in September were wetter than normal. Many all time high temperature records were set throughout the period but especially in July followed by all time high precipitation records for several localities in September. Figure 11 provides a rough idea of where the hot and dry conditions were most severe during the period. This area was also impacted by the 1995 drought and further tree stress can be expected.

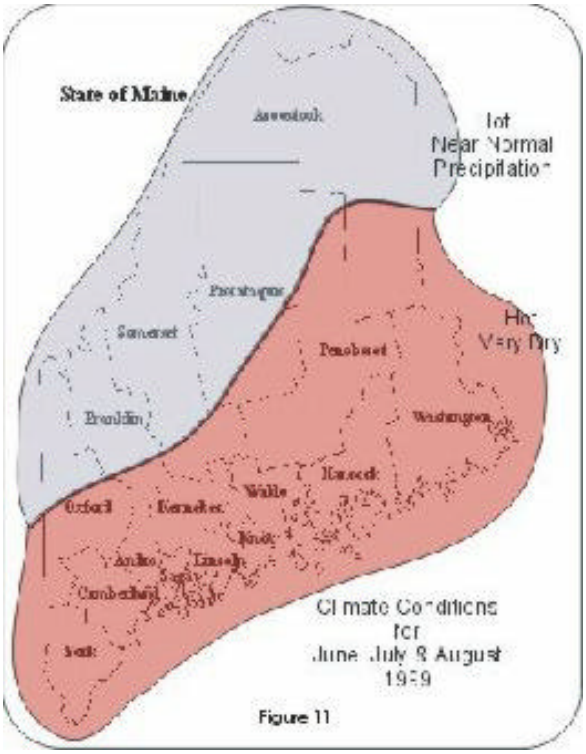


Figure 11

Dutch Elm Disease (caused by *Ophiostoma ulmi* and *Ophiostoma novo-ulmi*) - Symptoms of Dutch elm disease (DED) were conspicuous throughout Maine during 1999 and generated occasional inquiries of our staff.

Many old elms which escaped the initial wave of infection now succumb each year, at least partially the result of the development of more aggressive strains of the disease organism. While protecting these older specimens is the concern of most of our clients, we occasionally receive calls regarding mortality of younger elm trees (4-8" dbh and 20-30 feet tall). Such trees are frequently numerous in old field areas, the progeny of susceptible old elms now long gone. The progeny are, of course, also susceptible to Dutch elm disease and, due to their high numbers and density, are extremely vulnerable to mini-epiphytotics (epidemics). Increasingly we are asked to comment on the suitability of 'American Liberty' elms for planting in Maine. Residents of many communities long to restore the elm-canopied streets they remember from their youth or have viewed in historical photographs. They wonder if the extensive planting of DED resistant 'American Liberty' elms is an appropriate means to restore yesterday's urban landscapes.

We don't think so, for several reasons, but would not discourage limited elm plantings in selected areas.

The 'American Liberty' elm is not one clone but a group of six selections. Collectively they exhibit some resistance to DED but are not immune. Almost certainly some of those six selections are more resistant than others, but to line city streets with elms that are only partially resistant to DED is a risky proposition at best. And while 'American Liberty' elms are perhaps the best known and most available of the resistant sorts, they are not necessarily the most resistant.

Two resistant cultivars recently released by the U.S. National Arboretum, 'New Harmony' and 'Valley Forge,' are attracting considerable attention but apparently are not yet generally available for retail sale. Of these 'Valley Forge' may be the more resistant but 'New Harmony' may be more cold tolerant, an important consideration for Maine.

We would encourage limited plantings of resistant cultivars in areas where trees could be easily removed if they become diseased such as in park areas away from utility lines and structures. But we don't feel that the

development of resistant cultivars has reached the point where large scale elm restoration along city streets is yet appropriate.

Eastern Dwarf Mistletoe (caused by *Arceuthobium pusillum*) - Severe damage as the result of infection by this parasitic plant continues to occur in stands of white spruce in coastal areas of Maine. Evidence of significant mistletoe infestation was noted in 1999 on coastal headlands and islands from Machias in the east to the Boothbay region in the west. Trees of landscape value succumb each year in the yards of coastal residences as this organism gradually drains trees of their vigor. Removal of witches'-brooms (infected portions of branches), together with appropriate fertilization, generally helps to maintain the vigor of affected landscape trees. But such measures are impractical in woodland areas, and several islands in Friendship and Port Clyde have recently been extensively harvested in response to mistletoe damage.

Dwarf mistletoe also frequently occurs on black spruce, particularly in inland bogs, and on red spruce in many forest situations. Brooms on red spruce are often more poorly developed than on white or black spruce and may be overlooked. However infected residual trees left during timber harvesting activity can result in the infection of spruce regeneration. Infected trees should therefore be identified if possible and removed during the harvesting operation, and harvested areas revisited every ten years or so to remove any symptomatic trees missed during the initial harvest.

European Larch Canker (caused by *Lachnellula willkommii)* - European larch canker is a fungal disease which originated in Europe and was first found on native larch (tamarack) in southeastern Maine in 1981. Information gathered from existing cankers indicates this disease has been present in Maine since at least the 1960's and perhaps much longer. This disease may infect any species of the genus *Larix* or *Pseudolarix*. Since larch canker has the potential for causing serious damage to both native larch stands and reforestation projects utilizing non-native larches in Maine and elsewhere, the disease is under state and federal quarantine.

Each year we survey one or more towns close or adjacent to known infested areas (Fig. 12) to check for evidence of disease spread.

MFS surveys in 1999 of previously uninfested areas proved negative. Commercial larch seed orchards in the towns of Unity and Howland were also checked for evidence of larch canker; no disease was found.

The trend for this disease is static.

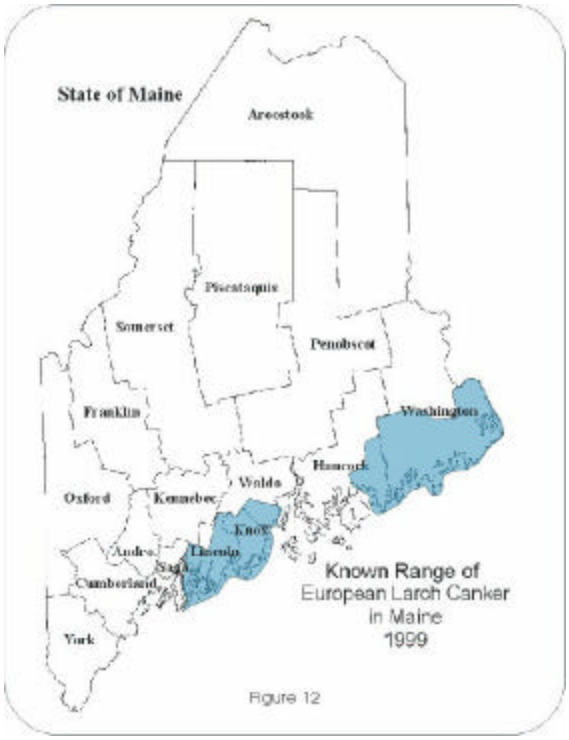


Figure 12

Fir-Fern and Fir-Fireweed Rusts (caused by *Uredinopsis mirabilis* and *Pucciniastrum epilobii*, respectively) - These diseases were generally present at moderate levels statewide in 1998, up for the second straight year. Most reports were from the Central Maine area, including Pittston, China, Waterville and Newburgh.

Horse-chestnut Leaf Blotch (caused by *Guignardia aesculi*) - This disease, which causes brown, irregular blotches on leaves often bordered by a yellow band, was less severe in 1999 than in 1998, but still quite conspicuous as it is in most years.

Ice Damage to Trees - Now almost two years after the "Ice Storm of 1998," affected trees continue to lose value due to stain and decay, and mortality is becoming more pronounced.

The best sprouters, ash, willow, and red maple, are rapidly rebuilding crowns while poorer sprouters such as poplar and white birch are now beginning to die or are rapidly losing quality. Some white birch, still bent from the weight of persistent ice, are sending a few epicormic sprouts skyward along their stems. Many poplar, which lost extensive crown portions, are now dead.

Stain and decay are now present in wood below snapped stem portions, and is proceeding downward at the rate of about one foot per year. This discoloration and decay will continue to progress downward for many years, even in surviving trees. And while the discolored portions will be confined to an area equivalent to the diameter of the tree at the time of stem breakage, and new layers of sound wood will be added over time, we still recommend that trees with complete stem breakage be harvested now. Trees with branch breakage, but with main stems intact and healthy rebuilding crowns, may be left in the residual stand if better trees are not available to occupy the space available.

Many urban trees which were heavily damaged have now been removed and replaced with healthy new transplants. But some street trees, especially various species of maple which appeared to weather the ice storm with minimal damage, now show the results of ice stress. Weakened branches in tree crowns were left susceptible to the invasion of weak pathogens such as coral spot nectria canker and *Cerrena unicolor*, which now have very conspicuous fruiting bodies on branches and stems.

Lichens - Lichens growing on dead and dying conifers are frequently and falsely accused of having a role in tree decline and death. We had several reports in 1999 from landowners concerned about lichens. Lichens certainly look as though they ought to be parasitic and many people have a hard time believing that they are not. While they do grow profusely on declining and dead trees, those trees are almost certainly dying for other reasons.

Lichens are comprised of fungi and algae growing symbiotically. Since the algal component is a green plant, light is required for growth. Lichens grow more rapidly when exposed to full light, which explains their profusion on dead trees.

Needle Blight of White Pine (caused by ? *Canavirgella banfieldi*) - This disease, which we have called semimature tissue needle blight (SNB) in past years, was again conspicuous in 1999 though less so than in the preceding two years. This disease causes needle tips to turn brown in July which then fade to a grayish tan overwinter. Typically not all needles in a fascicle are affected. During the summer affected needles, though brown at some point beyond the needle base, exhibit no outward signs of fungal infection. By the following spring, however, numerous fruiting bodies of various secondary fungi may be apparent, confounding attempts to identify a causal pathogen. Needle browning is typically more severe on sides and lower crowns of affected trees, while the top is less symptomatic. And some trees are apparently resistant, so only a portion of trees in a stand is typically affected.

Affected needles and fascicles gradually weather from the trees during the spring, and tree appearance improves as new growth emerges.

While this problem generates many calls from homeowners, woodlot managers, and golf course superintendents, it is primarily an aesthetic problem except for Christmas tree growers, a percentage of whose trees may become unmarketable. Even colorants such as Greenzit do not successfully mask the brown discoloration.

Oak Wilt (caused by *Ceratocystis fagacearum*) - To date there is no evidence that this disease occurs in Maine.

Phomopsis Galls (caused by *Phomopsis* sp.) - Every year we receive a few calls regarding the presence of galls on various species of hardwoods, especially red and black oak. These galls are often very conspicuous, ranging from the size of a pea on smaller twigs to the size of a basketball on larger branches, and are especially evident when leaves are off trees. Typically only one or two trees will be affected in the landscape, with neighboring trees apparently not susceptible. Frequently galls will cause dieback of smaller branches, but generally trees seem to tolerate infection fairly well.

This is a difficult disease to diagnose with certainty because no fungal fruiting bodies are apparent on the galls. The fungus must be cultured from infected tissue and allowed to fruit before a positive diagnosis can be made.

Little is known about the etiology of this disease and it is therefore difficult to recommend effective control actions. However we suggest that in forest stands affected trees be harvested early or as encountered to reduce inoculum. In landscape settings affected trees should be diagnosed early so that attempts may be made to prune infected tissue from trees before the disease gets out of hand.

Pine-Pine Gall Rust (caused by *Endocronartrium harknessii*) - This disease occurs in natural stands as well as in forest and Christmas tree plantations in Maine. We have found it in natural stands of jack pine in such diverse locales as Parlin Pond and Steuben, and in plantations of Scotch and jack pine from all over the state. It occurs especially frequently in Scotch pine plantations, even where no nearby infection is present in the wild, as the result of the planting of infected nursery stock.

Once established in a plantation this disease may be hard to manage. Removal of infected trees (or branches containing galls) early in the rotation and before the end of April each year will help keep the disease from spreading to healthy trees. It is important when establishing plantations of hard pines to plant only healthy nursery stock.

We had no calls regarding this disease in 1999, but observed the disease frequently on our travels, especially on jack pine in east coastal Maine.

Pinewood Nematode (*Bursaphelenchus xylophilus*) - Pinewood nematode in Maine is primarily a problem of stressed trees, especially those stressed by being planted off site. But many plantations (including ornamental plantings) are in fact established off site and we suspect that pinewood nematode has played a role in the mortality of pine and perhaps other species in such situations, even though the presence of pinewood nematode was never confirmed. The pinewood nematode, which causes the most serious disease of pines in Japan (pine wilt), also occurs in the United States in all states east of the Mississippi River. Although pinewood nematode was not discovered in the United States until 1929, it is considered to be a native, not introduced, pest. There is no indication that pinewood nematode has ever caused large scale mortality of conifers in Maine or elsewhere in North America.

Porcupine Damage (caused by *Erethizon dorsatum*) - Reports of porcupine damage to forest trees, evergreen plantations, and ornamental plantings continue at high levels statewide. It is uncertain whether porcupine populations have actually increased in recent years or whether the more numerous reports simply reflect an increasing acreage of higher value conifer plantation and seed orchard trees, situations where porcupine damage is less easily ignored.

In an attempt to define whether porcupine populations are indeed on the rise throughout Maine, one of our staff members has undertaken a count of porcupines killed by vehicles along roadsides in the course of his travels. This survey, known as SPLAT (Special Porcupine Lethal Automobile Tire survey), does not pretend to be scientific, but it may over time provide a rough approximation of porcupine population trends. The staff member undertaking the count consistently drives about 50,000 miles per year and covers the entire state, although the survey is weighted to the Central Maine area where relatively greater travel occurs.

The SPLAT survey is now five years old and while no trends are yet apparent, there is also no indication that porcupine populations are declining significantly. In 1995, 99 dead porcupines were counted and in 1996 the total was 93. In 1997 the total was 123, in 1998 109 porcupines were counted, and in 1999 the total was 110.

Pot-Bound Root Systems - In recent years we have noted an expansion in the production of field-grown nursery stock using root control container systems. This technology, where a fabric "pot" is inserted into the ground and an ornamental "liner" planted within, is designed to permit partial but restricted root development through the pot and into the soil surrounding the fabric pot. The idea is to force the root system of the ornamental plant to develop primarily within the fabric pot so that much of the root system mass and energy will remain with the plant when it is lifted.

But some growers are apparently culturing plants within these fabric pots beyond recommended time limits, and root systems are eventually escaping the confines of the fabric pots, especially by "climbing" over the tops of the partially buried pots. When this happens the original, restricted root system tends to decline in vigor and may even die. Then, when the plants are lifted, escaped healthy roots are often pruned to the margin of the fabric pot, leaving only a damaged, distressed or dead root system. Such nursery stock does not establish well when outplanted, or may not establish at all.

One client in Brunswick constructed an extensive planting of hemlocks in 1999 using such overgrown planting stock and, despite excellent follow up care, watched the entire planting gradually wither and die.

Rhabdocline and Swiss Needlecasts of Douglas Fir (caused by *Rhabdocline pseudotsugae* and *Phaeocryptopus gaeumannii*) - In recent years we have experienced a gradual reduction in calls related to these two diseases as growers of Christmas trees have cut back or curtailed production of Douglas fir. But a few plantations persist, and where they are established on new sites where Douglas fir was not previously planted, transplants typically grow to almost Christmas tree size before disease becomes epiphytotic.

Many Maine Christmas tree growers lost interest in Douglas fir some time ago because of its extreme susceptibility to *Rhabdocline* and Swiss needle cast fungi under Maine conditions. And in the landscape not only is Douglas fir frequently attacked by these two disease fungi, but it also serves as a powerful alternate host for the buildup of Cooley spruce gall adelgid on Colorado blue spruce when it is planted nearby. So its liabilities often exceed its assets, though it does make a handsome Christmas tree when disease and adelgids are under control.

Rhabdocline and Swiss needlecasts appear similar to the casual eye, and while they have slightly different life cycles, the same spray program if broadly applied will control both diseases. For more information on diagnosis and control of these and other Christmas tree pest problems, you may wish to request our Circular No. 11, Integrated Crop Management Schedule for the Production of Christmas trees, which has been recently revised and is attached to this report.

Root Rot of Balsam and Fraser Fir (caused by apparently native soil fungi attacking trees planted off site) - Losses of balsam and fraser fir Christmas trees due to root rot in plantations established on poorly drained sites continued statewide in 1999. We had noted this phenomenon for many years, particularly with fraser fir, and dismissed it as being due to an intolerance by that species for "wet feet." But balsam fir was also occasionally affected, and in 1998 losses of both species on certain moist sites became quite pronounced following a wetter than normal spring season.

Tree mortality on these sites continued into 1999 and we tried this year to isolate a causal fungus. Dr. Bill Livingston of the University of Maine assisted in that effort, and two fungi were found to be associated with the problem. One was a species of *Fusarium*; the other appeared to be one or more species of *Cephalosporium* which could have been simply micro-conidial stages of *Fusarium.* Both findings are preliminary, but there was no evidence that *Phytophthora*, a common root rotting pathogen of fraser fir in other parts of the country, was present in the infected root tissue.

Salt Damage (caused by movement of deicing salts from road surfaces to susceptible plant species) - Symptoms of salt damage to roadside vegetation were much less conspicuous than usual during the 1998-1999 winter season. The mild winter season apparently resulted in the need for substantially lower quantities of applied road salt than usual.

Scleroderris Canker (caused by *Ascocalyx abietina*) - No new infestations of this disease were located during 1999. This disease remains static at very low levels.

Sirococcus Blight of Red Pine (caused by *Sirococcus conigenus*) - Sirococcus blight of red pine seems to have increased in severity in Maine in recent years, especially in the Eustis-Flagstaff area, but also in plantations elsewhere in the state. Inquiries to us about this disease in managed forest areas generally fit into one of three categories: (1) infection of reproduction in thinned stands beneath infected overstory vegetation (2) infection of plantations established adjacent to infested natural stands or (3) infection within new plantations which were established in locations remote from known inoculum sources, due to the use of infested planting stock.

In many areas of Maine, serious infection of red pine reproduction beneath infected overstory trees is so probable that it is not cost effective to thin stands to allow for natural red pine regeneration. However white pine seems resistant and may perform well as an alternative regeneration species in such situations.

Infection of plantations established adjacent to infested natural stands is also highly likely, especially if tall overstory trees are left standing. Sirococcus often moves quickly into new plantations established under such circumstances, and by the time the disease is detected, it is often too late for sanitation pruning to be cost effective.

Infection of new plantations due to the use of infested planting stock is also a problem, since the disease is seed borne and seedlings are likely to be infected in nursery beds or greenhouses where container stock is produced. Use of disease free stock is of paramount importance when establishing red pine plantations.

This disease is also occasionally a problem on various species of spruce in landscape situations. Several blue spruce specimen trees were noted this year in Gorham with moderate levels of shoot mortality

For more information on diagnosis and control of this and other conifer plantation problems, you may wish to request our Circular No. 12, Integrated Crop Management Schedule for Softwood Timber Plantations and Conifer Seed Orchards.

Sphaeropsis Blight (caused by *Sphaeropsis sapinea* syn. *Diplodia pinea*) - This disease, primarily of two-and three-needle pines, seems to have increased in severity in recent years, especially on red pine in mid-coastal areas. Plantation pines seem especially hard hit with symptoms ranging from tip blight to the death of entire trees.

Other than in older red pine plantations in coastal areas, this disease is mostly a problem in landscape plantings around homes and estates, parks, along roadsides and on golf courses. It is generally not a problem in the natural forest environment.

Spring Frost Damage - A “cold snap” during the week of May 9, 1999 resulted in significant damage to emerging growth of balsam fir Christmas trees, especially in portions of Central Maine. The mornings of May 11, 12, 13, and 14 were particularly frosty, and we received many reports of damage to Christmas trees in a band ranging from Sangerville to Amherst. Reports of damage to oak and beech were received from the Carrabasset Valley and Bingham areas, and nursery stock grown in areas to the south of Maine, which had flushed new growth then was shipped here for resale, was also significantly damaged.

Spruce Decline - The declining health of Maine’s coastal spruce stands intensified in 1999, due to extremely dry conditions that persisted into September (see Drought p. 50). Spruce stands along the central and eastern Maine coast in Hancock, Waldo, Lincoln and Washington Counties exhibited the most significant deterioration. White spruce seemed to exhibit more stress than red. Tree crowns exhibited signs of declining vigor such as a sharply reduced foliage complement, numerous dead or dying branches, and poor foliage color. In many stands trees carried only two or three years of needles and foliage was restricted to the top 25% of the crown. Healthy coastal spruce usually carry 5 to 8 years of needle growth. Many 50 to 80 year-old coastal white spruce stands are now overmature for the site and are growing at an extremely slow rate. This slow growth and poor vigor has made coastal spruce increasingly susceptible to blowdown and biological pests including **eastern dwarf mistletoe**, **spruce beetle**, and **hemlock looper**.

The impact of most of the factors killing or causing stress to mature coastal spruce have been made much more significant because most stands have had little or no stand management throughout their existence. Trees are old, tightly spaced, on generally poor sites, and no effort has been made to increase stand vigor by removal of weak stems. The age and maturity of many stands is causing a steady deterioration that is now being noticed by owners and still other owners have seen their lands affected by catastrophic events such as a severe attack of spruce beetle.

Verticillium Wilt (caused by *Verticillium dahliae*) - This is primarily a disease of maples in ornamental situations but it affects other hardwood species in the landscape as well. Leaves yellow and wilt on branches of affected trees. The disease often progresses until wilt affects the entire crown. Greenish streaks or bands appear in sapwood beneath the bark. The green stain may appear as a partial or complete "ring" in the sapwood when a cut branch is viewed in cross section.

Affected trees may die or recover. Water and fertilizer may stimulate the growth of affected trees and improve prospects for recovery.

The causal fungus is soil borne, so replacing one tree which has succumbed to this disease with another susceptible species on the same site is a very risky proposition. Among trees known to be resistant to *Verticillium* include all the gymnosperms, plus apple and crabapple, mountain ash, beech, birch, butternut, oak, poplar and willow.

Although this disease is not uncommon in Maine, we recorded no inquiries regarding it during 1999.

White Pine Blister Rust (caused by *Cronartium ribicola*) - We continue limited control efforts to manage this disease in certain high value pine stands each year. In 1999 a total of 4,319 acres of high quality pine timber was scouted for *Ribes* plants in the Androscoggin County town of Auburn. A total of 2,782 *Ribes* was destroyed.

Triclopyr (Garlon 4) remains our herbicide of choice, mixed at the rate of 6 oz./gallon of water. In 1999 a total of 78 ounces of Garlon 4 was mixed with water to provide a total finished volume of 13 gallons.

White pine blister rust continues to be a problem of trees in the landscape as well, often involving trees which were infected when purchased as nursery stock.

This disease remains static at moderate levels.

Recently there has been intense interest by the commercial *Ribes* industry to relax quarantine efforts in many states to permit the culture of currants and gooseberries, especially for juice. The cranberry juice industry seems particularly interested in expanding its product base to include cranberry-currant juice. And many currant growers are eager to expand their operations in the northeastern United States, where conditions for *Ribes* culture are ideal.

This prospect is anathema to quarantine regulators in many state government agencies, who have spent careers attempting to eradicate and prohibit the sale of currants and gooseberries in white pine growing areas. *Ribes* advocates are convinced that *Ribes* and pine can co-exist as profitable crops, especially now that resistant cultivars are available. Pine growing interests are concerned that the resistance may be incomplete or may not carry into future generations of *Ribes* progeny distributed into the wild by birds or other vectors. Government agencies are concerned that the legal introduction of resistant varieties and the prohibition of susceptible varieties would be a nightmare to regulate.

White Pine Decline (triggered by the summer drought of 1995) - White pines in many forest stands in southwestern Maine continue to succumb to complications of the drought that area experienced during the summer of 1995. While the drought was the "trigger" which started many trees to decline, a variety of secondary factors have continued to extend the mortality to the present.

Symptoms of this problem are somewhat variable, but typically scattered co-dominant and understory trees develop a complete browning of the crown. Single, dominant pines with large crowns are less frequently affected. In early stages of decline, affected trees often exhibit thinning crowns, shortened needles, and an off-color, chlorotic appearance. Many affected trees exhibit resin flowing from multiple areas of the upper

stem, but this symptom is not apparent on all trees. There are patches of dead phloem tissue associated with resin flow, but often no insect activity nor white pine blister infection is apparent. In some cases cankers enlarge and have blue stain associated with them. *Septobasidium* canker is often abundant in affected stands.

Despite the widespread nature of the 1995 drought, white pine decline is not noted in all stands. It is worse on gravelly, well-drained soils, especially along the Little Ossippe and Saco Rivers in the Acton/ Limerick/Limington/Waterboro areas, but affected trees can be found as far north as Pittston and Skowhegan, even on heavier soils.

We anticipate mortality will subside in most stands over the next couple of years, and remaining trees will respond to the reduced competition with an increased growth rate. But in extreme cases entire stands may die. Because affected trees become symptomatic and die over a period of time, several entries into a stand may be necessary to salvage trees before they become economically worthless.

Winter Injury - Winter injury effects on trees and shrubs were generally mild during the winter of 1998-1999. Forsythia over much of southern Maine flowered right to the tops of shrubs indicating low flower bud mortality. Flower bud abortion on some clones of *Rhododendron yakusimanum* was pronounced, however. Tender ornamental evergreens such as yews, rhododendrons and dwarf Alberta spruce showed much less browning than usual.

Yellow Witches'-broom of Balsam Fir (caused by *Melampsora caryophyllacearum*) - These perennial, bushy yellowish growths on branches of fir trees have been unusually abundant in Christmas tree plantations throughout the state in recent years. Resulting largely from infections which occurred in 1995, and to a lesser extent in 1996, these growths have now attained significant size, up to a foot or more in diameter. Many are now sufficiently large to leave significant "holes" in the crowns of trees when removed, as they generally are prior to sale of Christmas trees. If growths are not removed a hole is of course not created, but the remaining brushy growths are devoid of needles which were cast earlier in the season, and not at all attractive.

This disease is caused by a fungus which uses chickweed as an alternate host plant. Elimination of the alternate host plant through use of selective herbicides in and around plantations may reduce infection, but most fir Christmas tree growers are content to simply prune brooms from trees while those growths are still relatively small.

Forestry Related Quarantines in Maine

There are four forestry related quarantines currently in effect in Maine. They are: White Pine Blister Rust, Gypsy Moth, European Larch Canker, and Hemlock Woolly Adelgid. However, at year's end in 1999, a quarantine for the **Pine Shoot Beetle**, ***Tomicus piniperda*** was being planned in the northeast states for possible implementation in early 2000 (see p. 3 & 18).

I. The White Pine Blister Rust Regulations and Quarantine are listed under Title 12 MRSA 1988, Subchapter III, §803:8305 Shipment Prohibited.

The director may prohibit, prevent or regulate the entry into or movement within the State, from any part thereof to any other part, of any plants of the genus *Ribes* or other nursery or wildling plants, stock or parts of plants which may cause the introduction or spread of a dangerous forest insect or disease. The director may issue the necessary orders, permits and notices necessary to carry out this section which shall not be considered to require or constitute an adjudicatory proceeding under the Maine Administrative Procedure Act, Title 5, Chapter 375.

Regulation: White Pine Blister Rust, Quarantine on Currants and Gooseberry Bushes.

A. The sale, transportation, further planting or possession of plants of the genus *Ribes* (commonly) known as currant and gooseberry plants, including cultivated wild, or ornamental sorts) is prohibited in the following counties in the State of Maine, to wit: York, Cumberland, Androscoggin, Kennebec, Sagadahoc, Lincoln, Knox, Waldo, Hancock, and parts of Oxford, Franklin, Somerset, Piscataquis, Penobscot, Aroostook, and Washington.

B. The planting or possession of European Black Currant, *Ribes nigrum* or its varieties or hybrids anywhere within the boundaries of the State of Maine is prohibited. This quarantine is administered by the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

II. The Gypsy Moth Quarantine is listed under 7 CFR Part 301.45, United States Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection and Quarantine as printed in the Federal Register.

A. This quarantine designates the infested area in Maine as quarantined for the movement of regulated articles, which includes wood such as logs, pulpwood, trees, shrubs, firewood,Christmas trees, and chips, and requires the inspection and certification of such material if movement is to non-infested states and foreign countries. This is administered by the USDA-APHIS, PPQ in Bangor, Maine, phone 945-0479.

B. Inasmuch as Maine is not completely infested and quarantined, wood or regulated articles moving from the infested area of the state to the non-infested area must be accompanied by a certificate or go to a mill under state compliance agreement which allows the reception of such articles. Regulated articles moving from the non-infested area of the state to other non-infested states or non-infested parts of Canada must be accompanied by a state permit stating that the regulated article originated outside of the infested area of the state. This is managed by the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

III. The European Larch Canker Quarantine is listed under 7 CFR Part 301.91 of the United States Department of Agriculture, Animal & Plant Health Inspection Service, as published in the Federal Register, and also under Title 12 MRSA, §8305 of the Laws of the State of Maine.

A. This quarantines all parts of larch (*Larix* spp.) including logs, pulpwood, branches, twigs, etc., as regulated articles.

B. Also any other product, article, or means of conveyance whatsoever, when it has been determined by an inspector that it presents a risk of spread of the disease.

C. Designates parts of Hancock, Knox, Lincoln, Waldo, and Washington counties as the quarantined area from which movement is restricted.

This is managed by the USDA-APHIS, PPQ in Bangor, Maine, phone 945-0479, and the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

IV. The Hemlock Woolly Adelgid Quarantine is listed under 7 MRSA, Chapter 409, §2301-2303 of the Laws of the State of Maine.

This quarantine was adopted to attempt to prevent the introduction of the Hemlock Woolly Adelgid (*Adelges tsugae* Annand) into Maine. This pest has been found to cause mortality of Eastern Hemlock (*Tsuga canadensis*) in infested states. Since hemlock is a major component of Maine's forest on over one million acres, protection of this valuable resource from damage by the Hemlock Woolly Adelgid is essential.

A quarantine is established against the following pest and possible carriers.

A. Pest: Hemlock Woolly Adelgid (*Adelges tsugae* Annand).

B. Area Under Quarantine: The States of Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Alaska, California, Oregon, Washington, and the District of Columbia.

C. Articles and Commodities Covered: Hemlock seedlings and nursery stock, logs, lumber with bark, and chips.

D. Restrictions: All articles and commodities covered are prohibited entry into the state from the area under quarantine unless specified conditions (listed below) are met.

1. Hemlock seedlings and nursery stock are: admissible into Maine provided each lot is accompanied by a certificate issued by the Department of Agriculture or Conservation of the State of the origin with an additional declaration that said material is free from Hemlock Woolly Adelgid.
2. Hemlock logs, lumber with bark, and chips are: admissible provided that said material is only shipped to preapproved sites within Maine. Such shipments must be made under a compliance agreement between the shipper and the Maine Forest Service, Department of Conservation. If said material is shipped to other sites, it must be accompanied by a certificate issued by the Department of Agriculture or Conservation of the state of origin affirming (a) the material was grown in the state of origin, and that either (b) the material is free from Hemlock Woolly Adelgid, or that (c) the material originated from an uninfested area in the state of origin.

This quarantine is administered by the Maine Department of Agriculture, phone 287-3891 and the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

Additional information is available in the body of this report, on our website (see p. i & 8) and in the two free fold-out leaflets:

FH&M. 1989. European Larch Canker - The European Larch Canker in Maine. Me. DOC, MFS, FH&M Div. and USDA-APHIS. Color fold-out leaflet. 6 pp.

Ouellette, D.E. (Compiler). 1997 (April). Regulations and Guidelines for Shipping Christmas Trees, Wreaths and Decorative Plant Materials - Twigs, Nuts & Fruits Used in Wreath Making. A public information guide from the Plant Industry Div., Me. Dept. of Agr. and the MFS, FH&M Division. A pocket fold-out.

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INDEX

INDEX

INDEX

INDEX